AUG 1956
LIBRARY
POFI
FISH & WILDLIFE
SERVICE

EXPEDITION REPORTS
Q115
C4
V.12
Gt. Brit. Chall. Off.
Rept. scient.results...
Zoology
Vol.12
1885

LIBRARY
BUR. OF COMM. FISH.
HON. BIOL. LAB.

THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY—VOL. XII.

UNITED STATES COMMISSION OF FISH & FISHERIES
2655

LIBRARY
FISH & WILDLIFE SERVICE
PACIFIC OCEANIC FISHERY
INVESTIGATIONS

REPORT

ON THE

SCIENTIFIC RESULTS

OF THE

VOYAGE OF H.M.S. CHALLENGER

DURING THE YEARS 1873-76

UNDER THE COMMAND OF

CAPTAIN GEORGE S. NARES, R.N., F.R.S.

AND THE LATE

CAPTAIN FRANK TOURLE THOMSON, R.N.

PREPARED UNDER THE SUPERINTENDENCE OF

THE LATE

Sir C. WYVILLE THOMSON, Knt., F.R.S., &c.

REGIUS PROFESSOR OF NATURAL HISTORY IN THE UNIVERSITY OF EDINBURGH
DIRECTOR OF THE CIVILIAN SCIENTIFIC STAFF ON BOARD

AND NOW OF

JOHN MURRAY

ONE OF THE NATURALISTS OF THE EXPEDITION

BUREAU OF FISH
LIBRARY
WOODS HOLE
2653
UNITED STATES FISH COMMISSION
FISH & FISHERIES

ZOOLOGY—VOL. XII.

Published by Order of Her Majesty's Government

PRINTED FOR HER MAJESTY'S STATIONERY OFFICE

AND SOLD BY

LONDON:—LONGMANS & CO.; JOHN MURRAY; MACMILLAN & CO.; SIMPKIN, MARSHALL, & CO.
TRÜBNER & CO.; E. STANFORD; J. D. POTTER; AND KEGAN PAUL, TRENCH, & CO.
EDINBURGH:—ADAM & CHARLES BLACK AND DOUGLAS & FOULIS.
DUBLIN:—A. THOM & CO. AND HODGES, FIGGIS, & CO.

1885

Price Sixty Shillings.

UNITED STATES COMMISSION
2653

37 60

LIBRARY
FISH & WILDLIFE SERVICE
PACIFIC OCEANIC FISHERY
INVESTIGATIONS

PRINTED BY NEILL AND COMPANY, EDINBURGH,
FOR HER MAJESTY'S STATIONERY OFFICE.

CONTENTS.

Report on the Annelida Polychæta collected by H.M.S. Challenger during the years 1873–76.

By William C. M'Intosh, M.D., L.R.C.S.E., LL.D., F.R.SS. L. & E., F.L.S., C.M.Z.S., Soc. Psychol. Par. Soc. Honor., &c., Professor of Natural History in the University of St. Andrews.

EDITORIAL NOTE.

The Report on the Annelida Polychæta, by Professor William C. M'Intosh, F.R.S., &c., occupies the whole of the present volume, and forms Part XXXIV. of the Zoological Series of Reports on the Scientific Results of the Expedition.

The preparation of this valuable Report has occupied Professor M'Intosh over seven years, and it will be welcomed by all naturalists as a most laborious and painstaking contribution to Science.

The Manuscript was received by me in fifteen batches, at various dates, between the 8th August 1884 and the 20th July 1885.

John Murray.

Challenger Office, 32 Queen Street,
Edinburgh, 1*st September* 1885.

CORRIGENDA ET ADDENDA.

Page vii, line 12, *for* "Edward" *read* "Edouard."
„ 21, "Pl. IIa. figs. 8–12" *should be* "Pl. IIa. figs. 9–11."
„ 27, "Pl. III. fig. 3" *should be* "Pl. III. fig. 2."
„ 29, "Pl. IIIa. figs. 10–12" *should be* "Pl. IIIa. figs. 10, 11."
„ 34, *Aphrodita australis*, *for* "Pl. VII." *read* "Pl. VI."
„ 39, *Lætmonice producta*, insert reference to "Pl. VI. figs. 1, 2."
„ 67, *Lepidonotus cristatus*, "Pl. XI. fig. 2" (*not* "fig. 3"), and "Pl. XVII. fig. 1" (*not* "Pl. XVIII.")
„ 71, after "*Eunoa opalina*" insert "Pl. VIIIa. figs. 9–11."
„ 77, *for* "Pl. XXXII. fig. 7" *read* "Pl. XXXIIa. fig. 7."
„ 111, for "*Polynoë platycirrus*" read "*Polynoë platycirrata*."
„ 135, *for* "Pl. XXIIa." *read* "Pl. XIIIa."
„ 170, line 9 from foot, for "*Genetyllis lutea*" read "*Genetyllis oculata*."
„ 172, line 7 from foot, for "*Genetyllis lutea*" read "*Genetyllis oculata*."
„ 223, line 10 from foot, *transpose* "lat." *and* "long."
„ 240, in explanation of woodcut, fig. 4 "*capensis*" should be "*pettigrewi*."
„ 244, line 4, for "*Lumbriconereis capensis*" read "*Notocirrus capensis*."
„ 299, line 6 from bottom, *after* "Pl. XXXVIII. figs. 6–8," *add* "fig. 19."
„ 337, line 14 from bottom, after "*Hyalinœcia tubicola*, &c.," add "Pl. XL. fig. 2."
„ 343, for "*Glycera tesselata*" read "*Glycera tessellata*."
„ 345. *Glycera capitata*, also from Station 11: lat. 38° 10′ S., long. 9° 11′ W.; depth, 170 fathoms; sea-bottom, green mud.
„ 346, line 2, for "*brevicirris*" read "*brevicirrus*."
„ 359, line 14, *for* "Station 141, &c.," *read* "Station 145a, December 27, 1873; lat. 46° 41′ S., long. 38° 10′ E.; depth, 310 fathoms; sea-bottom, volcanic sand."
„ 385, insert "*Chætozone*, Malmgren."
„ 394, line 16, for "*antarctia*" read "*antarctica*."
„ 394, line 17, "west" *should be* "east."
„ 480, line 4 from foot, *add* "also from Christmas Harbour, Kerguelen."
„ 481, line 12 from foot, *for* "above" *read* "below."
„ 481, lines 5 and 6, *for* "above the ventral edge" *read* "below the dorsal arch."

THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY.

REPORT on the ANNELIDA POLYCHAETA collected by H.M.S. Challenger during the years 1873–76. By WILLIAM C. M'INTOSH, M.D., L.R.C.S.E., LL.D., F.R.SS. L. & E., F.L.S., C.M.Z.S., Soc. Psychol. Par. Soc. Honor., &c., Professor of Natural History in the University of St. Andrews.

INTRODUCTION.

DURING the organisation of the Challenger Expedition the subject of the Annelids had several times been brought under my notice by the late Dr. Gwyn Jeffreys, who more than any other marine zoologist in our country had kept the department in view during various dredging expeditions in the neighbouring seas. Though unable, by reason of strict and responsible official engagements, to lend any active service to the Expedition, I had explained as fully as possible the best mode of preserving these somewhat delicate animals (Annelids) both to Professor Wyville Thomson and Mr. Murray. Towards the middle of 1877 I received intimation from Sir Wyville Thomson about the examination of this part of the collection, which he described as somewhat limited in extent. A review of the specimens, however, on their arrival proved that instead of being limited, the series was an extensive one, and reflected much credit on the scientific staff of the Expedition. This was probably due to the interest taken in the group by the late Dr. Rudolf von Willemoes-Suhm, a young naturalist of great ability, whose previous acquaintance with the Annelida had been considerably extended by a trip to the Færöes just before the equipment of the Challenger. He was chiefly occupied with the Crustacea, it is true, during the voyage, though a few notes and sketches he made on the Annelids will be specially referred to. The loss of this

accomplished and energetic young naturalist[1] was a serious blow to the zoological staff of the Expedition.

Mr. Murray forwarded eight pages of sketches and notes made by Dr. v. Willemoes-Suhm. The first refers to a Nematoid parasite in a prawn procured on February 24, 1874 (Antarctic Ocean), in 150 fathoms, apparently very similar to one found in a prawn in Shetland many years ago, and forwarded to Dr. Cobbold. The second is an *Eteone* (probably new) from the Spanish coast, Station L., lat. 41° 58′ N., long. 9° 42′ W., in 1125 fathoms. The third is termed by Dr. v. Willemoes-Suhm a Syllidean, but it also approaches the Alciopidæ in the structure of the feet. The fourth sketch enables me to supplement the description of *Dalhousia atlantica* (p. 186), and to correct the remark that there is no median tentacle. Dr. v. Willemoes-Suhm did not attach any name to this form, but there can be no doubt it is the same specimen. In the fresh animal the elevated areas of the head do not seem to be so prominent, and Dr. v. Willemoes-Suhm figures the crescentic pigment-mass on each side as the posterior pair of eyes, while the smaller pair behind the large anterior eyes are not shown. In his view of the foot a long slender ventral cirrus is indicated, this being absent in the preparation. His figure of a ventral bristle is quite recognisable, and he adds a wing or gumel in the fresh specimen at the tip. Moreover, the drawing of the pharyngeal region and stomach is characteristic, no armature, as already stated, being present. The tail terminates somewhat bluntly, has two median slender cirri, and two lateral jointed processes, thus agreeing with the arrangement at the anterior end. It is satisfactory that the further information derived from the sketches of the lamented naturalist does not alter in any material respect the position assigned to this novel form.

The fifth sheet represents a pen and ink sketch of the peculiar *Trophonia wyvillei* (p. 366) of the natural size, and one of its bristles, under the term "Annelide aus der Ophelien-Familie," while it is further stated "Fuss-stummeln und Kiemen fehlen gänzlich." It is not remarkable that this form should have given rise to ambiguity. The sixth series of sketches are connected with *Myriochele* from Station 20 (p. 410). Dr. v. Willemoes-Suhm termed the form *Myriochele abyssorum*, "n. sp.," but as his figure of the hook is not minutely accurate enough for satisfactory comparison, and the figure of the body of the animal shows no new feature, the decision that it is *Myriochele heeri*, Malmgren, is perhaps at present prudent.

The seventh plate represents a *Protula* from "600 fathoms," Cape St. Vincent, Portugal. It is uncertain whether this be *Protula lusitanica*, from Station II., 470 fathoms, or another form. All Dr. Willemoes-Suhm states is that it is a "Serpuloid." The eighth and last sheet gives an imperfect sketch of *Hydrophanes*, procured on August 20, 1873, off St. Paul's Rocks. From the partial outline with pen and ink this seems

[1] For an interesting memorial of R. von Willemoes-Suhm, Ph.D., *vide* Challenger Briefe an C. Th. E. von Siebold; Nach dem Tode des Verfassers herausgegeben von seiner Mutter. Leipzig, 1877, and also the Narr. Chall. Exp., vol. i. p. 769, 1885.

to be a remarkable form with some superficial resemblances to the Polynoidæ, though it may be a larval animal belonging to a different type. The absence of minute descriptions, with the exception of *Trophonia agrilleï*, and still more of specimens, prevents anything further being advanced about the foregoing sketches.

Numerous specimens of *Sternaspis* occurred in the collection, but, believing with Selenka, Vejdovsky, and others, that this group lies between the Chætopoda and Gephyrea, they were at once forwarded with a few other forms to Prof. E. Ray Lankester, who at that time intended to work up the Gephyreans.[1] It was my intention to describe the Nemerteans, and, indeed, sections of the majority had been made, and an outline of the group and its literature prepared. So much work, however, had fallen to my lot since my return to St. Andrews, especially in connection with the fisheries, that with Mr. Murray's sanction I had great pleasure in handing over the Nemerteans to my friend Prof. Hubrecht of Utrecht, in whose skilled hands the interests of science will be more than safe. I confidently look forward to the publication of the recent important researches of Dr. Hubrecht, based on the Nemerteans of this Expedition.

A few Crustacean parasites occurred on the Annelids, and it has been deemed proper to describe them along with their hosts rather than separate them by giving them over to another worker.

In order to gain a correct view of the position occupied by the group to which this Report is devoted, I have made a few notes on some of the previous voyages. These must not by any means be regarded as complete or exhaustive, but simply represent a few broad touches to aid in bringing out the relations of the series of Annelids collected by the Challenger to previous efforts in this department.

The earlier voyagers seldom included the Annelids in their collections, though it is true a ship-captain brought some specimens to Pallas, and gave that author an opportunity of describing certain new forms; while a few others, for instance Adler, mention them in connection with phosphorescence. In some of these voyages the invertebrates, however, formed a prominent feature, *e.g.*, in Phipp's Voyage to the North Pole in H.M.S. "Racehorse."[2] Moreover, in this early expedition it is evident considerable care had been taken to secure specimens, and the use of the trawl on the northern shores of Spitzbergen is a feature of considerable interest. Three Annelids are mentioned as having been thus procured, viz., *Serpula spirorbis*, *Serpula tripetra*, and *Sabella frustulosa*, the latter characterised by "Testa solitaria libera simplici curvata; fragmentis conchaceis sabulosisque." The attention given to zoology in this expedition is noteworthy, and in contrast, for instance, with what was done in M. Sonnerat's Voyage à la Nouvelle Guinée,[3] which was published shortly afterwards.

[1] *Vide* Report on the Gephyrea, collected by H.M.S. Challenger, by Prof. Emil Selenka of Erlangen. Zool. Chall. Exp., part xxxvi., 1885.

[2] London, 1774, 4to.

[3] Paris, 1776.

The voyages in the latter part of the eighteenth century and the beginning of the nineteenth showed little improvement in this respect. Thus the cruise round the world in the ships "King George" and "Queen Charlotte"[1] gave no addition to our knowledge of this and some other invertebrate groups, though crabs, shells, and birds are mentioned and figured, and the same may be said of the French Voyage de la Perouse autour du Monde.[2] Similar remarks apply to the trip to Cuba and St. Domingo by M. E. Descourtilz,[3] and to Baron Albert von Sack's Voyage to Surinam.[4] The cruise of H.M.S. "Investigator"[5] to Australia and other ports was even less productive in this department.

Captain Tuckey's voyage to the Zaire (usually called Congo) contains a note[6] by J. Cranch that a new species of *Nereis* was taken on a bit of floating wood, lat. 6° 21′ 0″ N., long. 5° 49′ 37″ E., together with a genus not known to him. A single species (*Nereis heteropoda*) also is given by Chamisso and Eysenhardt in their Voyage Round the World.[7] There can be little doubt that during Sir John Ross' two Arctic voyages (1818 and 1829) Annelids of considerable interest must have been obtained, indeed, he mentions in his first voyage that "worms" were procured in the mud at the depth of 1000 fathoms. Unfortunately the collections in each case have disappeared.

In the Narrative of a Survey of the Intertropical and Western Coasts of Australia, by Captain King, the versatile talents of Dr. J. E. Gray added an Annelid to the list, viz., *Leodice gigantea*, Savigny,[8] which measured nearly five feet in length.

The presence of so acute an officer as Captain Ed. Sabine in Parry's first voyage[9] to Greenland, accounts for the mention of two species of Annelids from the "Fauna Grœnlandica," viz., *Polynoë cirrata* and *Polynoë scabra*. The notices of Annelids, however, at this time by navigators are brief and fragmentary, a single species, perhaps, only coming under observation, as for instance in Eschscholtz's voyage from Cronstadt to St. Peter and St. Paul, in which *Tomopteris onisciformis* is mentioned. Even in more ambitious voyages they made a small appearance, as for example in Freycinet's Voyage autour du Monde.[10] In other expeditions certain groups of Vermes become prominent, as in Rüppel's Atlas zu der Reise im nördlichen Africa, where the Planarians and Gephyreans (*Sipunculi*) are specially noticed by Leuckart. The Nemerteans, again, occupy a plate in the Voyage de l'Astrolabe, and reference is made to the elegant forms and rich coloration of such Annelids as *Amphitrite, Serpula, Nereis,* and *Terebella.*[11]

In the Voyages en Scandinavie et en Laponie,[12] considerable attention is given to

[1] By Captains Portlock and Dickson, London, 1789, 4to.
[2] 4 vols., Paris, 1797.
[3] Voyages d'un Naturaliste, &c., Paris, 1809.
[4] London, 1810.
[5] 2 vols. 4to., London, 1814.
[6] Narrative of an Expedition to Explore the River Zaire, &c., London, 1818, Appendix, p. 418.
[7] Berolini, 1819–1822 (?).
[8] London, 1818–1822, p. 437.
[9] Supplement to the Appendix of Captain Parry's First Voyage for the Discovery of a N.W. Passage, &c., London, 1824, p. 239.
[10] Frankfurt am Main, 1826.
[11] Voyage de l'Astrolabe (Zool.), MM. Quoy et Gaimard, Paris, 1834.
[12] 1838–1840.

the Nemerteans and Planarians, but little to the Annelids, though an atlas of fifty folio plates (many coloured) enriches the work. The groups just mentioned, on the other hand, disappear from such works as The Zoology of Captain Beechy's Voyage to the Pacific and Behrings Island in H.M.S. "Blossom,"[1] and the Voyage autour du Monde par les mers de l'Inde et de Chine exécuté sur la corvette de l'Etat la Favourite, though many other groups are mentioned in both works.

The extensive area traversed by H.M.S. "Sulphur," under the command of Sir E. Belcher, was barren of results in regard to the Annelids; and even Mr. Darwin's classic voyage in H.M.S. "Beagle" produced little in the department of the marine forms further than a few interesting Planarians, including a pelagic form in the open sea, off Fernando Noronha.

During the Antarctic voyage of Sir James Ross, Dr. (now Sir Joseph) Hooker[2] mentions that *Dexiopa* and another Annelid were dredged at 400 fathoms, while between 200 and 400 fathoms, off Victoria Land, *Serpula* and various other Annelids were procured by the same instrument. The interest taken by this author in the group is well shown by a series of carefully coloured drawings of Annelids made during the voyage in H.M. ships "Erebus" and "Terror," and forwarded to me by Mr. Murray for examination. These include examples of *Syllis* and *Nereis*, of the Phyllodocidæ and Lumbrinereidæ, fragments of the Terebellidæ, and a complete young form, a species like *Potamilla*, and various examples of the Serpulidæ, amongst which *Serpula aureaensis*, with its roseate branchial plumes, appears to be represented. Excellent drawings of *Tomopteris* and a *Pontobdella* conclude the list. That a botanist should have done so much under the circumstances merits more than a passing comment. From the published account of this voyage[3] a considerable amount of information is obtained about the nature of the natural harbours at Kerguelen, the muddy bottoms of which especially abound in Annelids.

The latter are, again, absent from the account of the voyage of H.M.S. "Fly,"[4] but the zoology of this expedition, it is true, comprises only four pages of the appendix. None occur in the invertebrates found during the voyage of H.M.S. "Samarang."[5]

A change was now, however, looming in the distance, and the publication of Prof. Edward Grube's account of the Annelids procured in the Reise in den äussersten Norden und Osten Sibiriens,[6] forms one of the earlier indications of increased attention to the group. Several expeditions, however, the accounts of which were published after this date, give little information on the subject, such as the United States Exploring Expedition (C. Wilkes),[7] the Voyage autour du Monde of "La Bonite,"[8] and

[1] London, 1839, 4to. [2] *Ann. and Mag. Nat. Hist.*, ser. i. vol. xvi. p. 238, 1845.
[3] Voyage of Discovery and Research in the Southern and Antarctic Regions, London, 1847, 4 vols.
[4] 2 vols. 8vo., London, 1847.
[5] Zoology of the Voyage of H.M.S. "Samarang," under Sir E. Belcher, London, 1850.
[6] St. Petersburg, 1851. [7] Philadelphia, 1852. [8] Paris, 1852.

Macgillivray's Narrative of the Voyage of H.M.S. "Rattlesnake,"[1] yet in the latter the powerful help of Assistant-Surgeon T. H. Huxley was available. As an example of the scanty reference to the group in these, it may be mentioned that the only example of the "Vers" in the Zoologie of the "La Bonite" is *Sagitta bipunctata*. This work, however, is pre-eminent in its folio atlas of beautifully coloured steel engravings. No improvement on the foregoing in regard to the Annelids occurred in the zoology of H.M.S. "Herald," edited by Edward Forbes;[2] and the same may be said of The Last of the Arctic Voyages, by Sir E. Belcher.[3]

The presence of W. Stimpson in the United States Surveying Expedition to the North Pacific, Japan Sea, &c., resulted in the brief description[4] of various Annelids, but the contribution is limited and difficult to follow from the absence of illustrative figures. In the voyage of A. S. Œrsted to the West Indies and Central America, and that of H. Kroyer to South America, about a hundred Annelids were procured, and these formed the materials for Grube's well-known Annulata Œrstediana,[5] which only lacked figures to have been much more important. All previous expeditions, however, were eclipsed by the able report of Kinberg on the Annelids of the Swedish frigate "Eugenie,"[6] in which a thoroughly scientific grasp of this subject was taken, and the aid of a really skilful artist obtained in drawing the structural features of the animals. Unfortunately, but a fragment of the work is complete, the majority of the forms being only known by brief descriptions in the Öfversigt k. Vetensk.-Akad. Förhandl. Such a contribution marks an era in the list of voyages, and is equally creditable to Kinberg and his country.

Following close upon this publication is the treatise by Schmarda on the Turbellarians Rotifers and Annelids procured "Auf einer Reise um die Erde." The second volume is composed for the most part of an account of the marine Annelids, with nineteen brightly coloured plates (steel engravings) and many woodcuts, and both it and the former are referred to constantly in the subsequent Report on the Annelids collected by the Challenger. The work[7] forms a conspicuous landmark in the history of the subject, and though often failing in severe attention to structural details, bears evidence of much labour and perseverance.

The many voyages undertaken in our country previous to the Challenger Expedition had produced zoologically results of considerable value, though the scientific staff connected with their production both at home and abroad was often of a very limited description. We were, however, not in advance of other countries in this respect. This is boldly shown by the liberal subsidy by government which enabled the fine series of volumes (six of which were zoological) giving the results of the Austrian Novara Expedition to

[1] London, 1852. [2] London, 1854. [3] London, 1855.
[4] *Proc. Acad. Nat. Sci. Philad.*, 1855, &c.
[5] Vidensk. Meddel. f. d. nat. Foren., 1856–58.
[6] Kongliga svenska Fregatten Eugenies Resa omkring jorden, &c., Stockholm, 1858.
[7] Zweite Heft, Leipzig, 1861.

surpass anything of this kind previously published in our own country. Grube took the Annelids[1] in hand, and in less than half a hundred pages and four fine steel plates carefully described them and figured the most interesting. In this department, therefore, the comparison with the Annelidan results of the Challenger is noteworthy, since both ships traversed similar seas.

Stimulated by such examples as the foregoing, as well as by the activity of the Scandinavians and Americans, and more than all by the influence of the late Sir Wyville Thomson and Dr. Gwyn Jeffreys, in conjunction with Dr. Carpenter, our own government fitted out the "Lightning" and "Porcupine," and in both ships, notably in the final expedition of the latter (1870), very considerable additions were made to our knowledge of the Annelids, especially by the labours of Prof. Ehlers of Göttingen, who, after the death of Edward Claparède, examined those frequenting deeper water than 500 fathoms in the "Lightning" and "Porcupine" expeditions of 1868 and 1869. Subsequent voyages have further extended our information in the Annelidan department, as for instance the cruise of Dr. Gwyn Jeffreys in the "Valorous" to Davis Strait, the last North Polar Expedition under Sir George Nares, the Transit of Venus Expedition to Kerguelen, the dredgings of Captain St. John in the China Sea, and those of Dr. John Murray in the "Knight Errant" and "Triton" in the North Atlantic.

The recent advances made in our knowledge of the Annelids by the expeditions of other nations have been numerous; indeed, no well-organised exploration of the ocean now returns without representatives of the group. Amongst others that occur to me are the American expeditions in the "Blake," the Annelids of which are now in the skilled hands of Prof. Ehlers; the collection made by the German exploring ship "Gazelle," a preliminary account of which was published by the late veteran zoologist, Prof. Grube, in 1877, and which is frequently referred to in the following pages; the Annelids of the Swedish North Polar Expedition under Prof. Nordenskiold, as described and figured by Théel; and those of the Norwegian North Atlantic Expedition by Hansen. In the Challenger a large number of the Annelids were procured in the trawl, and this is consonant with our own experience in British waters. The extensive surface afforded by the trawl, and the readiness with which Annelids, Nemerteans, and even such forms as *Corymorpha* cling to the meshes is remarkable, while perhaps it is occasionally vain to search for them with a dredge.

General Condition of the Preparations.

In reviewing the condition of the preparations forwarded for examination, it has to be stated that many, as might have been expected, are injured or have to be described from mere fragments. A few had been dried. The great depth from which others were obtained probably caused laceration or softening before they reached the surface, and in

[1] Annel. Novara-Exp., Zool. Theil., Bd. ii. Abth. 3, 1868.

this respect it is well to remember that many spontaneously rupture on the slightest irritation.

In regard to the preservation of the Annelids, it is unsafe to mix them with other classes, for when separation is carried out by hands that perhaps are imperfectly acquainted with the group, loose scales or cirri are apt to be overlooked, and are thus irretrievably lost.

One important aid in dealing with any group was entirely absent, viz., coloration. The staff on board the Challenger was wholly inadequate to overtake this department, yet the beauty of the marine Annelids as a whole depends on the endless variety and often gorgeous loveliness of their hues.

Methods followed in Description.

In dealing with the materials placed at my disposal, an external survey of each was made under a lens, the structure of the feet, the minute anatomy of the bristles and hooks, as well as of the body-wall and other parts, was considered. It was impossible, however, to do more than glance at the anatomy of the group in passing, leaving for the present, for instance, such interesting questions as the nature of the remarkably folded organ (called liver by Johannes Steen[1]) at the anterior part of the alimentary canal (below and at the sides of the gullet) of *Terebellides*, for future consideration. Little reliance was placed on the description of the bristles and hooks without accurate representations, since many species come so close that it would be very difficult for one's successors to comprehend all the details. The distinctions while reliable are fine. Moreover, the hard parts just mentioned are less liable to be altered by the spirit than the soft tissues of the animals. The remarkable modifications observed in the bristles of every foot in many of the groups, and which are so disposed that a regular gradation in form exists between those at the superior border, and those at the inferior border, afford even a more complex subject for reflection than the changes undergone by the spines of an Echinoderm.

Classification.

The large number of new forms brought within our knowledge by the Challenger would have been supposed to lead to a noteworthy change in classification, but from the first it was apparent that no new family was required. All the types fell under the groups already constituted, and which have been very satisfactorily given by Malmgren in his Annulata Polychæta.[2] A careful review of these groups in connection with the arrangement and relations of the nerve-cords, and the general structure of the body-wall,

[1] *Jenaische Zeitschr.*, Bd. xvi. p. 227, Jena, 1883.

[2] Helsingfors, 1867.

in 1876[1] led me to give a general support to this classification, and further experience has not as yet shown the necessity for any material change. It is true there are some forms, such as the genus *Eulepis*, which almost merit the distinction of a separate family, but they have only recently been discovered, and may properly be left for further investigation.

Species.

While perhaps some species might have been united, the difficulties surrounding the subject (arising chiefly from imperfect descriptions and figures of essential parts) have been considerable. It is hoped, however, that the present observations and drawings will enable subsequent observers to clear up the discrepancies. There can be no doubt, as A. S. Œrsted observed, that a single accurate figure, for instance of a characteristic hook or bristle, is of greater consequence in certain cases than an elaborate Latin description; moreover, experience does not altogether bear out the statement made by Hansen with regard to the Polynoidæ, viz., that the scales are of greater importance in specific separation than the bristles. A specimen certainly would be more easily and accurately determined with both scales and bristles present, but some, including myself, would consider a specimen of greater value with bristles and without scales, than with scales and without bristles.

No less than about two hundred and twenty *new* species fall to be noticed.

Food of Annelids.

In many cases the food of the Annelids has been examined, and as there can be no question (excluding surface forms) that this was obtained on the bottom of the ocean, the condition of the various types in their alimentary canals has a direct bearing on their bathymetrical distribution. Thus the almost perfect state of some organisms, for example, Foraminifera and Radiolaria, with their contained protoplasm in the digestive tracts of Annelids from great depths, leads us to conclude that in all probability they live there, and do not in all cases fall to the bottom for the nourishment of the fauna of that region. The discrimination shown by the Annelids in regard to food may readily be observed by contrasting the muddy contents of the alimentary canal with that forming the tube. Most feed on mud containing minute organisms, but others devour their neighbours, small Crustaceans, zoophytes, and sponges, while a few, such as certain Nereids and Eunicidæ, are partial to Fuci and other Algæ.

[1] *Proc. Roy. Soc. Edin.*, 1876–77, vol. ix. p. 372. This paper has escaped the notice of Dr. Pruvot in his Recherches Anat. et Morphologiques sur les systéme Nerveux des Annelides Polychétés, *Archives d. Zool. expér.*, 1885, No. 2, p. 210.

Tubes.

The majority of the tubes formed by the Annelids collected by the Challenger have been described along with their inhabitants, but a few remarks are necessary on certain empty tubes. A very striking form is one procured by the trawl at Station 298 (south of Valparaiso); lat. 34° 7′ S., long. 73° 56′ W.; depth, 2225 fathoms; bottom temperature 35°·6, surface temperature 59°; sea-bottom, blue mud. The same form comes from the neighbouring Station 299. It consists of a triangular tapering tube (Pl. XLIX. figs. 8, 9) composed of very fine dark mud, and having the three ridges hispid with short muddy processes. On magnifying the surface between the ridges (fig. 9) peculiar transverse markings, which almost resemble scutes, are observed. Its occupant probably pertained to the Terebellidæ or a neighbouring family, but no trace of it was found.

The tubes composed of the secretion produced by the body of the animal, such as those of *Hyalinæcia* and *Eunice*, are of course independent of their surroundings, but the majority have a composite nature, viz., have either an internal lining of the secretion or an admixture, and an external investment of mud or other solid particles. On the blue mud and red clay the tubes are often almost entirely formed of these deposits. As *Globigerinæ* appear these are studded over the surface of the mud; while in certain localities the discoid Foraminifera are set on edge on the surface of the mud so as to render the tube hispid. Massive tubes, almost entirely composed of Foraminifera, occurred at Station 155 (south of Australia). Small bivalves and other Molluscs are also largely used to strengthen and protect muddy tubes, and the extreme development of this method is shown in the empty tube in fig. 13 of Pl. XXXIXA. from Port Jackson. The tube is quite squamous, from a close series of Molluscan valves which overlap each other around the tube.

General Remarks.

The drawings of the first fifty-five plates were made by my niece, who patiently endeavoured to render them as life-like as possible, though it was hardly possible in all cases to represent minute structural detail. Moreover, many of the specimens were so much injured that difficulty was felt in making a satisfactory picture; indeed, previous knowledge of their structure was necessary in this respect. Upwards of thirty plates and the woodcuts are from my own drawings, a fact which will explain the somewhat tardy appearance of the Report, which had to be carried on amidst one or two distractions. Mr. Edward Prince and Mr. John Wilson, my former students and prizemen, aided me with several of the concluding plates; while Dr. R. Marcus Gunn, previously associated with me in Perthshire, and now one of the ophthalmic surgeons at Moorfields, illustrated his own observations on the eyes of the Alciopidæ and Phyllodocidæ.

It may be deemed by some an inconvenience to refer to several plates for the structural and other details of the same species, but the study of the Annelids is a matter that requires so much deliberation that the inconvenience is comparatively slight. Moreover, it was found that different treatment was required in the execution of the structural plates. In the explanations of the latter, it has not been thought necessary to go into details, since this had already been done in the text.

I have to acknowledge the unfailing courtesy of Dr. John Murray, who, after the death of Sir Wyville Thomson, became Director of the Challenger Commission, of Mr. Hoyle, M.A., M.R.C.S., Naturalist to the Commission, and Mr. Monteith of the same office, who suggested improvements in passing the work through the press. Prof. Moseley also kindly forwarded a fine specimen of the Hexactinellid Sponge (*Crateromorpha meyeri*) infested by *Syllis ramosa*, from the Oxford Museum. It was procured off the Philippines by Capt. Chimmo of H.M.S. "Herald."

To Prof. Flower, Director of the British Museum, as well as Prof. Jeffrey Bell and Mr. S. O. Ridley of the same institution, I am much indebted for their aid in examining the Annelids in the collection. I am especially obliged to Prof. Jeffrey Bell for his patient and courteous attention in this respect. Lastly, Dr. Murie's valued aid in the Library of the Linnean Society deserves my cordial acknowledgments.

GEOGRAPHICAL AND BATHYMETRICAL DISTRIBUTION.

In the following arrangement I have adopted the regions given by Prof. Busk in his able Report on the Polyzoa, which regions are generally acquiesced in by most observers. They are, indeed, such as suggest themselves in a natural grouping of the oceanic areas.

In the first of these, **A.**, the North Atlantic Region (see the sketch-map), a large number of forms occur, and relatively few range to other areas; but this apparent definition in so vast a region is probably due to the comparatively unexplored condition both of it and the other oceans. Within its limits marked diversities present themselves, such as the comparative absence of the Amphinomidæ (with the exception of *Paramphinome*) in the north-eastern part of the area, and their abundance in the south-western; the appearance of the Euphrosynidæ between tide-marks in the southern parts, and their limitation to the deeper water in the northern. Most of the genera are cosmopolitan in their range, but the remarkable new genus *Buskiella* is entirely confined to the abysses of this and the South Atlantic. Many interesting extensions of the previously known range of genera have been made by the Challenger, for example, the finding of *Eulepis* in the West Indies, its original habitat being in the Philippines. The cosmopolitan habits of such types as *Harmothoë imbricata*, *Hyalinœcia tubicola*, *Scolecolepis cirrata*, and *Terebellides stremi* have also been more clearly disclosed.

Surface Forms.

Besides the purely pelagic Alciopidæ, which were met with by the Challenger in the Atlantic and Antarctic Oceans, as well as more abundantly in Mid Pacific, off the Sandwich Islands, Tomopteridæ and various larval forms occurred. Amongst the latter were young Terebellidæ, about half an inch in length, which were caught in the Atlantic on the return voyage. Various larval *Polygordii* were found in the tow-nets near St. Vincent, Cape Verde Islands, along with Tornaria, Pteropods, and Copepods. *Tomopteris*, again, ranged to both Atlantic and Pacific Oceans, and was accompanied by *Sagitta*, Copepoda, and various larval forms such as the young of *Chirodota*. The

surface-fauna of our own seas presents similar characters, though such types as *Alciopa* are rarely met with. A remarkable feature in the surface collections of the Challenger is the occurrence of a *Glycera* of the ordinary marine type on the surface of an inland sea in Japan. The specimen is about an inch in length, and by no means larval, for the proboscidian armature is complete. The state of the nets perhaps may not have been such as lead to absolute reliance on this peculiar exception.

A. North Atlantic Region.

Station II. Off Setubal; lat. 38° 10′ S., long. 9° 14′ W.; 470 fathoms; green mud (dredged).

Allmaniella setubalensis, n. sp.
Nephthys malmgreni, Théel.
Syllis setubalensis, n. sp.
Praxilla challengeriæ, n. sp.
Euthelepus setubalensis, n. sp.
Protula lusitanica, n. sp.

Station III. Off Cape St. Vincent; lat. 37° 2′ N., long. 9° 14′ W.; 900 fathoms; blue mud (dredged).

Nothria conchylega, Sars.

Station VI. Off Gibraltar; lat. 36° 23′ N., long. 11° 18′ W.; 1525 fathoms; Globigerina ooze (trawled).

Ecarne tenuisetis, n. sp.
Nereis longisetis, n. sp.
Maldane malmgreni, n. sp.
Amphicteis gunneri, Sars.

Station 3. South of the Canaries; lat. 25° 45′ N., long. 20° 14′ W.; 1525 fathoms; hard ground (dredged).

Chloenea atlantica, n. sp.
Polynoë (Robertianella) synophthalma, n. sp., B.
Halodora reynaudii, Aud. and Edw. (surface).
Dalhousia atlantica, n. sp.

Station 20. East of the Antilles; lat. 18° 56′ N., long. 59° 35′ W.; 2975 fathoms; red clay (dredged).

Myriochele heeri, Malmgren.

Station 23. Off Sombrero and St. Thomas, West Indies; 390 to 450 fathoms (about).

Aphrodita intermedia, n. sp.
Eulepis challengeriæ, n. sp.
Psammolyce occidentalis, n. sp.
Macduffia bonhardi, n. sp.
Nothria sombreriana, n. sp. and var.
Scolecolepis cirrata, Sars, var. 2.
Chætozone atlantica, n. sp.
Maldane atlantica, n. sp.
Ampharete sombreriana, n. sp.
Melinna maculata, Webster.

Station 33. Off the Bermudas; lat. 32° 21′ N., long. 64° 35′ W.; 435 fathoms; coral mud (dredged).

Eulepis wyvillei, n. sp.
Eunotomastus grubei, n. sp.
Placostegus assimilis, n. sp.
Spirobranchus occidentalis, n. sp.

Station 36. Off the Bermudas; lat. 32° 7′ N., long. 65° 4′ W.; 30 fathoms; coral (dredged).

Notopygos megalops, n. sp.
Hipponoë gaudichaudi, Aud. and Edw. (surface).

Off the Bermudas, floating at surface on a log.

Amphinome rostrata, Pallas.
Hermodice carunculata, Pallas.

Between tide-marks, Bermuda.

Eurythoë pacifica, Kinberg, D.
Polynoë pustulata, n. sp.
Nereis (Perinereis) melanocephala, n. sp.
Eunice vittata, Della Chiaje, var. *cirrobranchiata*, n. sp.
barvicensis, n. sp.
Eunice sp.
Aricia platycephala, n. sp.
Cirratulus assimilis, n. sp.
Terebella crassicornis, Schmarda.
Pista sombreriana, n. sp.
Dasychone bairdi, n. sp.
Serpula sombreriana, n. sp.

Station 44. Off Chesapeake Bay; lat. 37° 25′ N., long. 71° 40′ W.; 1700 fathoms; blue mud (dredged).

Melinnopsis atlantica, n. sp.

Station 45. Off the North American coast; lat. 38° 34′ N., long. 72° 10′ W.; 1240 fathoms; blue mud (dredged).

Harmothoë benthaliana, n. sp.
Nephthys phyllobranchia, n. sp.
Lumbriconereis punctata, n. sp.
Eunice ærstedi, Stimpson.
Spiochætopterus sp.
Praxilla occidentalis, n. sp.

Station 47. Off the North American coast; lat. 41° 14′ N., long. 65° 45′ W.; 1340 fathoms; blue mud (dredged).

Laranda longa, Webster.
Lumbriconereis ehlersi, n. sp.
Aricia norvegica, Sars.
Aricidea fragilis, Webster.
Notomastus agassizii, n. sp.
Maldane sp.
Myriochele heeri, Mgrn., var.
Thelepus sp.
Terebellides stræmi, Sars.

Station 48. Nova Scotia; lat. 43° 4′ N., long. 64° 5′ W.; 51 fathoms; rock (dredged).

Eusyllis tubifex, Gosse.
Thelepus cincinnatus, O. Fabricius, var. *canadensis*, nov.

Station 49. Off Halifax; lat. 43° 3′ N., long. 63° 39′ W.; 85 fathoms; gravel, stones (dredged).

Euphrosyne borealis, Œrsted.
Lætmonice producta, Grube, var. *assimilis*, nov.
Nereis pelagica, Linnæus.
Potamilla torelli, Malmgren.
Protula americana, n. sp.

Station 50. Off North American coast; lat. 42° 8′ N.; long. 63° 39′ W.; 1250 fathoms; blue mud (dredged).

Chætozone benthaliana, n. sp.

Station 63. Mid Atlantic; lat. 35° 29′ N., long. 50° 53′ W.; 2750 fathoms; red clay (trawled).

Amphicteis gunneri, Sars, var. *atlantica*, nov.
Eupista darwini, n. sp., var., G.
Lanassa benthaliana, n. sp.
Ehlersiella atlantica, n. sp.

Station 70. West of the Azores; lat. 38° 25′ N., long. 35° 50′ W.; 1675 fathoms; Globigerina ooze (trawled).

Lætmonice producta, Grube, var. *willemoesi*, nov., B, C, D.

Station 73. Off the Azores; lat. 38° 30′ N., long. 31° 14′ W.; 1000 fathoms; Pteropod ooze (dredged).

Leanira hystricis, Ehlers.
Staurocephalus atlanticus, n. sp.

Station 75. Off Fayal, Azores; lat. 38° 35′ N., long. 28° 28′ W.; 450 fathoms; volcanic mud (dredged).

Lepidonotus squamatus, Linn.
Sigalion buskii, M'Intosh.
Hyalinœcia tubicola, O. F. Müller, B.
Glycera tessellata, Grube.
capitata, Œrsted.
Brachionuma vesiculosum, Montagu.
Ditrypa arietina, O. F. Müller.

Station 76. Off the Azores; lat. 38° 11′ N., long. 27° 9′ W.; 900 fathoms; Pteropod ooze (dredged).

Praxilla sp.
Terebella sp.

Off St. Vincent, Cape Verde Islands.

Hermione hystrix, Savigny
Lagisca tenuisetis, n. sp.
Lagisca perarmata, n. sp.
Phyllodoce sancti-vincentis, n. sp.
Hesione pantherina, Risso.
Nereis atlantica, n. sp.
Nereis (*Platynereis*) *dumerilii*, Aud. and Edw.
Nicidion sp.
Eunice torquata, De Quatrefages.
Sabellaria (*Pallasia*) *johnstoni*, n. sp.
Loimia savignyi, n. sp.
Laonome hæckelii, n. sp.

Station 101. Off Sierra Leone; lat. 5° 48′ N., long. 14° 20′ W.; 2500 fathoms; blue mud (trawled).

Buskiella abyssorum, n. sp., B.

Station 106. Mid Atlantic, near Equator; lat. 1° 47′ N., long. 24° 26′ W.; 1850 fathoms; Globigerina ooze (trawled)

Lagisca (*Aguodice*) *moseleyi*, n. sp.
Buskiella abyssorum, n. sp., B.

St. Thomas, West Indies, shallow water and between tide-marks.

Hesione sp. (?).
Nereis antillensis, n. sp.
Marphysa goodsiri, n. sp.
Sabella bipunctata, Baird.
Dasychone wyvillei, n. sp.
nigro-maculata (Baird).

B. South Atlantic Region.

In this region the two chief centres for specimens were the coast of Brazil and the Cape. As formerly indicated, the remarkable *Buskiella abyssorum* extended into the deeps (2025 fathoms) of this as well as the North Atlantic. The wide range of

Hyalinœcia tubicola, of which a large variety occurred off the South American coast, is also noteworthy. Some of the types, such as *Euphione*, *Pista mirabilis*, *Eupista*, and *Ranzania* are also peculiar.

STATION 113A. Off Fernando Noronha; lat. 3° 47′ S., long. 32° 24′ 30″ W.; 25 fathoms; volcanic sand and gravel (dredged).

Nereis eatoni, M'Intosh, **C.**

STATION 122. Off Brazil; lat. 9° 5′ S., long. 34° 50′ W.; 350 fathoms; red mud (trawled).

Syllis brasiliensis, n. sp.
Nereis (Ceratonereis) brasiliensis, n. sp.
Nematonereis schmardæ, n. sp.
Eunice equibranchiata, n. sp.

STATION 124. Off Brazil; lat. 10° 11′ S., long. 35° 22′ W.; 1600 fathoms; red mud (dredged).

Polynoë (Robertianella) synophthalma, n. sp., **A.**

STATION 133. Off Tristan da Cunha; lat. 35° 41′ S., long. 20° 55′ W.; 1900 fathoms; Globigerina ooze (trawled).

Lætmonice producta, Grube, var. *willemoesi*, nov., **A, C, D.**

STATION 141. South of the Cape; lat. 34° 41′ S., long. 18° 36′ E.; 98 fathoms; green sand (dredged).

Polynoë capensis, n. sp.
Syllis capensis, n. sp.
Lumbriconereis pettigrewi, n. sp.
Ranzania capensis, n. sp.
Prionospio capensis, n. sp.
Praxilla capensis, n. sp.

STATIONS 141, 142. Between tide-marks, Sea Point, Cape Town, and Simon's Bay, &c.

Euphrosyne capensis, Kinberg.
Lepidonotus wahlbergi, Kinberg.
Eunoa capensis, n. sp.
Polynoë attenuata, n. sp.
Eulalia capensis, n. sp.
Notocirrus capensis, n. sp.
Nematonereis sp.
Eunice murrayi, n. sp.
Trophonia capensis, n. sp.
Cirratulus capensis, Schmarda.
Nicomache capensis, n. sp.
Sabellaria (Pallasia) capensis, n. sp.
Schmardanella pterochæta, (Schmarda).
Dasychone violacea (Schmarda).

STATION 142. South of the Cape; lat. 35° 4′ S., long. 18° 37′ E.; 150 fathoms; green sand (dredged).

Euphione elisabethæ, n. sp. | *Dasychone capensis*, n. sp.
Protula capensis, n. sp.

STATION 320. Off South America; lat. 37° 17′ S., long. 53° 52′ W.; 600 fathoms; green sand (trawled).

Eulagisca corrientis, n. sp., C. | *Pista mirabilis*, n. sp.
Lænilla fusca, n. sp. | *corrientis*, n. sp.
Syllis robertianæ, n. sp. | *Sabella assimilis*, n. sp.
Hyalinœcia tubicola, O. F. Müller, var., A.

STATION 322. Off South America; lat. 35° 20′ S., long. 53° 42′ W.; 21 fathoms; sand and shells (trawled).

Terebella seticornis, n. sp.

STATION 325. Off the coast of Buenos Ayres; lat. 36° 44′ S., long. 46° 16′ W.; 2650 fathoms; blue mud (trawled).

Myriochele heeri, Malmgren, var. | *Amphictis sarsi*, n. sp.
Eupista grubei, n. sp.

STATION 333. West of Tristan da Cunha; lat. 35° 36′ S., long. 21° 12′ W.; 2025 fathoms; Globigerina ooze (trawled).

Buskiella abyssorum, n. sp., A.

STATION 335. North of Tristan da Cunha; lat. 32° 24′ S., long. 13° 5′ W.; 1425 fathoms; Pteropod ooze (dredged).

Nothria abranchiata, n. sp., C.

STATION 344. Off Ascension; lat. 7° 54′ S., long. 14° 28′ W.; 420 fathoms; volcanic sand (dredged).

Eunice progwatha, n. sp.

C. South Indian or Kerguelen Region.

One of the most striking features in the collection made in this region is the large proportion of species pertaining to Kerguelen. The abundance of Annelids in the deep water of the land-locked bays of this island, as well as the special opportunities of the naturalists for collecting them, probably account for their number. The bottom of these still inlets is also favourable to the increase of such forms. This is also the headquarters of *Lætmonice producta*, Grube, varieties of which, however, extend into several of the great oceans. The cosmopolitan nature of certain Annelids is shown by the occurrence of *Scolecolepis cirrata* and *Terebellides strœmi* in the same water. This region and the neighbouring sea contain also many new forms, Terebellidæ being especially conspicuous.

Station 144A. Off Marion Island; lat. 46° 48′ S., long. 37° 49′ 30″ E.; 69 fathoms; volcanic sand (dredged).

Lagisca antarctica, n. sp.
magellanica, n. sp., var. *grubei.*, nov.
Exogone heterosetosa, n. sp.
Nereis eatoni, M'Intosh, **B.**
Terebella flabellum, Baird.
Neottis antarctica, M'Intosh, **G.**
Serpula narconensis, Baird, **G.**

Station 145A. Off Prince Edward Island; lat. 46° 41′ S., long. 38° 10′ E.; 310 fathoms; volcanic sand (dredged).

Polyeunoa lævis, n. sp.
Eunice edwardsi, n. sp.
Scalibregma inflatum, H. Rathke, var.

Station 146. East of Prince Edward Island; lat. 46° 46′ S., long. 45° 31′ E.; 1375 fathoms; Globigerina ooze (trawled).

Lætmonice producta, Grube, var. *willemoesi*, nov., **A, B, D.**
Polynoë (*Admetella*) *longipedata*, n. sp.
Maldanella antarctica, n. sp.

Station 147. Between Prince Edward and Kerguelen Islands; lat. 46° 16′ S., long. 48° 27′ E.; 1600 fathoms; Diatom ooze (trawled).

Lætmonice producta, Grube, var. *benthaliana*, nov., **E.**
Lagisca crosetensis, n. sp.
Petta assimilis, n. sp.
Amphicteis wyvillei, n. sp.

STATION 149. Off Kerguelen; lat. 49° 8′ S., long. 70° 12′ E., &c. (dredged at and near).

Lætmonice producta, Grube.
Evarne kerguelensis, n. sp.
Eupolynoë mollis, M'Intosh.
Hermadion kerguelensis, n. sp.
Nephthys trissophyllus, Grube.
Salvatoria kerguelensis, n. sp.
Eusyllis kerguelensis, n. sp.
Syllis gigantea, n. sp.
Sphærosyllis kerguelensis, n. sp.
Autolytus macleavanus, n. sp.
Nereis kerguelensis, n. sp.
Lumbriconereis kerguelensis, Grube.
Eunice magellanica, n. sp. young (?).
Glycera kerguelensis, n. sp.
Scoloplos kerguelensis, n. sp.
Travisia kerguelensis, n. sp.
Trophonia kerguelarum, Grube.
Brada mammillata, Grube.
Scolecolepis cirrata, Sars, var.
Notomastus sp. (?).
Praxilla kerguelensis, n. sp.
assimilis, n. sp.
Ampharete kerguelensis, n. sp.
Amphitrite kerguelensis, M'Intosh.
Ereutho kerguelensis, n. sp.
Polycirrus kerguelensis, n. sp.
Artacama challengeriæ, n. sp.
Terebellides stroemi, M. Sars, var.
Spirorbis sp.

Between Kerguelen and Macdonald Islands; surface.

Tomopteris carpenteri, De Quatrefages.

STATION 151. Off Heard Island; lat. 52° 59′ S., long. 73° 33′ E.; 75 fathoms; volcanic mud (dredged).

Phyllocomus croceus, Grube.

Surface of sea between Stations 154 and 155 (Antarctic Sea). By tow-net.

Alciopa antarctica, n. sp.

STATION 156. Antarctic Sea; lat. 62° 26′ S., long. 95° 44′ E.; 1975 fathoms; Diatom ooze (trawled).

Nothria abranchiata, n. sp., B.
Ephesia antarctica, n. sp.
Grubianella antarctica, n. sp.
Leæna antarctica, n. sp.

STATION 157. Midway between the Antarctic region and Australia; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; Diatom ooze (trawled).

Lætmonice producta, Grube, var. *wyvillei*, nov.
Nothria armandi, n. sp.
Trophonia wyvillei, n. sp.
Praxilla abyssorum, n. sp.
Pista abyssicola, n. sp.

D. The Australian Region.

The types in this area are in many cases peculiar and novel. It and the Indian region are distinguished by the prominence of the *Chloeia* group, and the Australian specially by the remarkable nature of the Polynoidæ, *e.g.*, *Lepidonotus cristatus*, *Polynoë mirabilis*, *Polynoë platycirrata*, *Sedisetosus ceramensis*, *Eunoa iphionoides*, and *Eunoa abyssorum*. The latter is also the region of fine examples of the genus *Thalenessa*, of one of the most remarkable discoveries of the Challenger, viz., the branched *Syllis*, of many Eunicidæ, from the large *Eunice amphiroëtis* downward, of *Nereïdes*, the edible *Palolo*, and the striking *Nothria willemoesii* with its spinose tube. Comparatively few of the species range into the other areas if we except the ubiquitous varieties of *Lumbriconereis producta* and one or two others.

Station 158. Considerably south of Australia; lat. 50° 1′ S., long. 123° 4′ E.; 1800 fathoms; Globigerina ooze (trawled).

Hyalinæcia benthaliana, n. sp. | *Grubianella antarctica*, n. sp., var.

Station 160. South of Australia; lat. 42° 42′ S., long. 134° 10′ E.; 2600 fathoms; red clay (trawled).

Eunoa abyssorum, n. sp. | *Polynoë ascidioides*, n. sp.

Station 162. Bass Strait; lat. 39° 10′ S., long. 146° 37′ E.; 38 fathoms; sand and shells (dredged).

Polynoë platycirrata, n. sp. | *Eunice vittata*, D. Chiaje.
Thalenessa oculata, n. sp. | *pycnobranchiata*, n. sp.
Staurocephalus australiensis, n. sp. | *bassensis*, n. sp.

Station 163a. Twofold Bay, Australia; lat. 36° 59′ S., long. 150° 20′ E.; 150 fathoms; green mud (trawled).

Phyllodoce duplex, n. sp. | *Sabellaria* (*Pallasia*) *giardi*, n. sp.
Terebella grubei, n. sp.

Station 163b. Off Port Jackson; lat. 33° 51′ S., long. 151° 22′ W.; 35 fathoms; hard ground (dredged).

Aphrodita australis, Baird. | *Eunice aphroditois*, Pallas.
Thalenessa fimbriata, n. sp. | *Sabella fusca*, Grube.

Station 166. Off New Zealand; lat. 38° 50′ S., long. 169° 20′ E.; 275 fathoms; Globigerina ooze (trawled).

Eunoa iphionoides, n. sp.

Station 167a. Queen Charlotte Sound, New Zealand; lat. 41° 4′ S., long. 174° 19′ E.; 10 fathoms; mud (dredged at and near).

Leanira lævis, n. sp.
Nephthys verrillii, n. sp.
Hyalinœcia tubicola, O. F. Müller, var. *longibranchiata*, nov.
Eone trifida, n. sp.
Glycera lamelliformis, n. sp.
Aponuphis elisabethæ, n. sp.
Pomatocerus strigiceps, Mörch.

Station 168. Queen Charlotte Sound, New Zealand; lat. 40° 28′ S., long. 177° 43′ E.; 1100 fathoms; blue mud (trawled).

Eumenia reticulata, n. sp.
Maldanella neo-zealaniæ, n. sp.
Melinna armandi, n. sp.
Leæna neo-zealaniæ, n. sp.
Leæna langerhansi, n. sp.

Station 169. Off New Zealand; lat. 37° 34′ S., long. 179° 22′ E.; 700 fathoms; blue mud (trawled).

Lætmonice producta, Grube, var. *willemoesi*, nov., **A, B, C.**
Polynoë (*Macellicephala*) *mirabilis*, n. sp.
Lumbriconereis neo-zealaniæ, n. sp.
Notheria tenuisetis, n. sp.
minuta, n. sp.
Chætozone pacifica, n. sp.
Lanassa sarsi, n. sp.
Terebellides sp.

Station 170. Off the Kermadec Islands; lat. 29° 55′ S., long. 178° 14′ W.; 520 fathoms; volcanic mud (trawled).

Lagisca kermadecensis, n. sp.
Nicidon balfouriana, n. sp.

Station 171. North of the Kermadec Islands; lat. 28° 33′ S., long. 177° 50′ W.; 600 fathoms; hard ground (trawled).

Polynoë magnipalpa, n. sp.
Terebella kermadecensis, n. sp.

STATION 172. Off Tongatabu; lat. 20° 58′ S., long. 175° 9′ W.; 18 fathoms; coral mud (dredged).

Hesione pacifica, n. sp. | *Nereis (Platynereis) tongatabuensis*, n. sp.

STATION 174. South of Fiji Islands; lat. 19° 6′ S., long. 178° 14′ E.; 140 fathoms; coral mud (dredged).

Praxilla köllikeri, n. sp. | *Terebellides ehlersi*, n. sp.

Off the Fiji Islands.

Palolo viridis, Gray.

Off Levuka, Fiji.

Eurythoë pacifica, n. sp., var. *levukaensis*, nov., A. | *Psammolyce fijiensis*, n. sp.

STATION 186. Torres Strait; lat. 10° 30′ S., long. 142° 18′ E.; 8 fathoms; coral mud (dredged).

Lepidonotus cristatus, Grube. | *Eunice tribranchiata*, n. sp.
Eupompe australiensis, n. sp. | *Hyalinœcia tubicola*, O. F. Müller, var. *papuensis*, nov.
Eunice torresiensis, n. sp. |

Thelepus sp.

Arafura Sea, south of New Guinea.

Nephthys dibranchis, Grube. | *Eunice elseyi*, Baird.
Nereis (Platynereis) arafurensis, n. sp. | *Protula arafurensis*, n. sp.

STATION 192. Off Ki Island, Flores Sea; lat. 5° 49′ 15″ S., long. 132° 14′ 15″ E.; 140 fathoms; blue mud (dredged).

Syllis ramosa, n. sp., E.

Off Amboina (dredged).

Nothria willemoesii, n. sp. | *Glycera amboinensis*, n. sp.

Station 194a. Off Ceram; lat. 4° 31′ S., long. 129° 57′ E.; 360 fathoms; volcanic mud (trawled).

Scalisetosus ceramensis, n. sp.

Near Banda, off the Moluccas.

Chloeia fusca, n. sp.

Admiralty Islands; 16 to 25 fathoms.

Thalenessa digitata, n. sp.

E. Philippine or Japanese Region.

This region (E), like D, contains many species common to the shores of Hindustan, as shown by a series of beautifully coloured drawings made under the superintendence of Sir Walter Elliot of Wellelee,[1] and of the collections made by Dr. Anderson of the Imperial Museum of Calcutta. The *Chloeia* group is as well represented as in the former area (D), and in this respect agrees with the Bengal series. A variety of *Latmonice producta* is common to this region and C, while the rich waters of Japan add a new species to the genus, amidst a profusion of other remarkable types. The area is specially rich in new Polynoidæ, such as those commensalistic in *Euplectella*, and in the Hexactinellid Sponge lodging the branched *Syllis*. It is also the region of *Palmyra* and *Eupholoë*, and of the large-eyed *Genetyllis oculata*.

Station 201. Basilan Strait, south of the Philippines; lat. 7° 3′ N., long. 121° 48′ E.; 82 fathoms; stones and gravel (trawled).

Notopygos labiatus, n. sp.
Polynoë (*Lepidonotus*) *iphionoides*, n. sp.
Eunoa mindanavensis, n. sp.
Eupholoë philippensis, n. sp.
Eunice mindanavensis, n. sp.

Station 205. Off the Philippines; lat. 16° 42′ N., long. 119° 22′ E.; 1050 fathoms; blue mud (trawled).

Serpula philippensis, n. sp.

Off Hong Kong; 10 fathoms (dredged).

Dasychone orientalis, n. sp.

[1] I have to thank Sir Walter Elliot for so kindly permitting me to have these for several years. Unfortunately, no specimens accompanied the drawings, and thus much less could be accomplished with them than I at first anticipated.

Station 209. Off Zebu; lat. 10° 14′ N., long. 123° 54′ E.; 95 fathoms; blue mud (dredged).

Lagisca hexactinellidæ, n. sp.
Polynoë (Langerhansia) euplectellæ, n. sp.
Syllis ramosa, M'Intosh, D.
Cirratulus zebuensis, n. sp.
Artacama zebuensis, n. sp.
Sabella zebuensis, n. sp.

Station 214. South of Mindanao; lat. 4° 33′ N., long. 127° 6′ E.; 500 fathoms; blue mud (trawled).

Iphionella cimex, De Quatrefages.
Genetyllis oculata, n. sp.

Station 232. South of Yedo, Japan; lat. 35° 11′ N., long. 139° 28′ E.; 345 fathoms; green mud (dredged).

Lætmonice japonica, n. sp.
Eunoa yedoensis, n. sp.
Leanira areolata, n. sp.
Lumbriconereis bifurcata, n. sp.
japonica, Marenzeller.
Nothria macrobranchiata, n. sp.
Maldane sarsi, Malmgren.
Nicomache japonica, n. sp.
Praxilla lankesteri, n. sp.
Amphicteis japonica, n. sp.

Off Japan; lat. 33° 56′ N., long. 130° 27′ E.; 30 fathoms.

Ammotrypane gracile, n. sp.

Station 233a. Near Kobè, Japan; lat. 34° 38′ N., long. 135° 1′ E.; 50 fathoms; sand (dredged).

Palmyra aurifera, Savigny (?).
Lepidonotus gymnonotus, Marenzeller.
Polynoë ocellata, n. sp.
Leanira japanensis, n. sp.
Nereis (Platynereis) kobiensis, n. sp.
Eunice kobiensis, n. sp.
Phyllochætopterus claparedii, n. sp.
Pista fasciata, (Grube).
Dasychone picta, n. sp.
japonica, n. sp.
Hydroides multispinosa, Marenzeller.

Station 233b. South of Japan; lat. 34° 18′ N., long. 133° 35′ E.; 15 fathoms; blue mud (trawled).

Chloeia flava, Pallas.
Dasybranchus sp.

Station 235. South of Yedo, Japan; lat. 34° 7′ N., long. 138° 0′ E.; 565 fathoms; green mud (trawled).

Lætmonice aphroditoides, n. sp. | *Polynoëlla levisetosa*, n. sp.

Station 236. South Japan; lat. 34° 58′ N., long. 139° 29′ E.; 775 fathoms; green mud (trawled).

Thelepus marenzelleri, n. sp.

Off Yokohama, Japan; 550 fathoms.

Lagisca yokohamiensis, n. sp. | *Lumbriconereis heteropoda*, Marenzeller.

Station 241. North Pacific; lat. 35° 41′ N., long. 157° 42′ E.; 2300 fathoms; red clay (trawled).

Lætmonice producta, var. *benthaliana*, C. | *Nicomache benthaliana*, n. sp.
| *Eusamytha pacifica*, n. sp.

Station 244. Depths of the Pacific; lat. 35° 22′ N., long. 169° 53′ E.; 2900 fathoms; red clay (trawled).

Placostegus ornatus, Sowerby.

Station 246. Mid Pacific; lat. 36° 10′ N., long. 178° 0′ E.; 2050 fathoms; Globigerina ooze (trawled).

Melinna pacifica, n. sp.

F. North Pacific Region.

Comparatively few Annelids come from this region, but three out of the five are surface forms of interest (Alciopidæ). The members of this family thus frequent the superficies of all the great seas, from the Arctic to the Antarctic Oceans, and from the eastern to the western shores of the Americas. Prof. Huxley's remark that it is doubtful whether any well marked provinces of the ocean can be defined by the occurrence of purely pelagic animals thus still holds.

As to the causes which have led to the relegation of such peculiar forms as *Buskiella* to the remote abysses of the Atlantic, and of *Leæna abyssorum* and *Placostegus benthalianus* to the depths of the North Pacific, various opinions may be held. We have no reliable data in support of the view which supposes that these "primitive" types have

been gradually pressed by the more prolific and hardier shallow-water forms deeper and deeper into the ocean. In the case of *Izana* and *Placostegus*, again, both are members of genera not unknown in comparatively shallow water, and even between tide-marks.

Station 253. Mid Pacific; lat. 38° 9′ N., long. 156° 25′ W.; 3125 fathoms; red clay (dredged).

Izana abyssarum, n. sp. | *Placostegus benthalianus*, n. sp.

Surface of the sea at Honolulu.

Alciopa quadrioculata, n. sp. | *Alciopa* sp. (?).
Greeffia oahuensis, n. sp.

G. South Pacific Region.

The majority of the specimens from this area come from the Strait of Magellan, the confined waters of which seem to be favourable for their development. Of characteristic forms the most striking are *Aphrodita echidna*, De Quatrefages, two species of *Lepisca*, *Eunoa opalina*, *Leanira magellanica*, *Eunice*, *Nothria*, *Hemipodus*, *Samythopsis*, *Eupista*, and *Euthelepus*.

Station 272. Mid Pacific; lat. 3° 48′ S., long. 152° 56′ W.; 2600 fathoms; Radiolarian ooze (trawled).

Myriochele pacifica, n. sp.

Off Tetuaroa Islands.

Glycera sagittariæ, n. sp.

Station 285. Pacific; lat. 32° 36′ S., long. 137° 43′ W.; 2375 fathoms; red clay (trawled).

Placotegus mörchii, n. sp.

Station 298. Off the west coast of South America; lat. 34° 7′ S., long. 73° 56′ W.; 2225 fathoms; blue mud (trawled).

Lumbriconereis abyssorum, n. sp. | *Maldanella valparaisiensis*, n. sp.
Nothria pycnobranchiata, n. sp. | *Samythopsis grubei*, n. sp.
ehlersi, n. sp. | *Eupista darwini*, n. sp., A.

STATION 299. Off Valparaiso; lat. 33° 31′ S., long. 74° 43′ W.; 2160 fathoms; blue mud (trawled).

Euthelepus chilensis, n. sp.

STATION 302. West of Patagonia; lat. 42° 43′ S., long. 82° 11′ W.; 1450 fathoms: Globigerina ooze (trawled).

Vermilia sp.

STATION 306A. Strait of Magellan: lat. 48° 27′ S., long. 74° 30′ W.: 345 fathoms; blue mud (trawled).

Leanira magellanica, n. sp.

Hemipodus magellanicus, n. sp.

STATION 307. Strait of Magellan: lat. 49° 24′ S., long. 74° 23′ W.; 140 fathoms; blue mud (trawled).

Aphrodita echidna, De Quatrefages.

STATION 308. Strait of Magellan; lat. 50° 8′ S., long. 74° 41′ W.; 175 fathoms; blue mud (trawled).

Lagisca magellanica, n. sp.
darwini, n. sp.
Eunice magellanica, n. sp.

Serpula narconensis, Baird, var. *magellanica*, nov., C.

STATION 310. Strait of Magellan; lat. 51° 27′ S., long. 74° 3′ W.; 400 fathoms; blue mud (trawled).

Lagisca magellanica n. sp., var. *murrayi*, nov.

STATION 311. Strait of Magellan; lat. 52° 45′ S., long. 73° 46′ W.; 245 fathoms; blue mud (trawled).

Eunoa opalina, n. sp.

STATION 313. Strait of Magellan; lat. 52° 20′ S., long. 67° 39′ W.; 55 fathoms; sand (trawled).

Nereis patagonica, n. sp.

BATHYMETRICAL DISTRIBUTION.

In regard to bathymetrical distribution, the greatest number of species occur in the shallow water (10 fathoms and under), probably because much work was done in this region in the pinnace, especially in rich localities, and also because the opportunities for collecting between tide marks were fully taken advantage of; moreover, the surface-forms are included in this division. The two regions ranging from 10 to 50 fathoms and from 50 to 100 fathoms have each about the same number of Annelids, and both are similar in respect to new forms. In the three areas just mentioned, the known species are fairly represented, though the majority are new. The number between 100 and 200 fathoms is less than the foregoing, but the proportion of new forms is much higher, and several are of considerable interest, *e.g.*, *Syllis ramosa*. In the rich region ranging from 200 to 500 fathoms, very few known forms break the long list (the second of the series) of novel Annelids. About five new genera are included, and the remarkable types are exemplified by *Allmaniella*, *Scalisetosus*, *Eulepis*, *Genetyllis oculata*, *Macduffia*, *Hemipodus*, and *Euthelepus*. The number of species at this depth, however, may be partly due to the more frequent dredging therein. Between 500 and 600 fathoms the number falls to less than half that in the previous group, but the majority are new. The number found between 600 and 1000 fathoms include two known species out of a list of fourteen.

The four species occurring between 1000 and 1200 fathoms are new. Those between 1200 and 1500 fathoms are more than five times as numerous as the last, and include only five known forms, most of which, however, are found in shallow water as well as at this great depth, *e.g.*, *Eunice ærstedi*, *Aricia norvegica*, *Amphicteis gunneri*, and *Terebellides strœmi*, the latter three, besides, having a very wide geographical range. About the same number were procured between 1500 and 2000 fathoms. All are new, and three new genera required to be formed.

Between 2000 and 2500 fathoms the total numbers about half that just mentioned (between 1500 and 2000 fathoms), and all are new, while four new genera are present in the series. In the region between 2500 and 3000 fathoms several known forms occur, viz., *Latmonice producta*, a marked variety (*benthaliana*) of which, however, only is found at this depth, *Myriochele heeri*, *Amphicteis gunneri* (var. *atlantica*), and *Placostegus ornatus*. If the diagnosis be correct, the latter was first procured by Sowerby in shallow water in the Philippines. The two forms from the profound abyss of 3125 fathoms are new, though the genera are well known.

In glancing over the lists, and excluding the pelagic types, it is evident that no definite law as to the presence or absence of genera at particular depths, can be enunciated, though it is true that such genera as *Leæna*, *Eupista*, *Euthelepus*, *Melin-*

nopsis, *Eusamytha*, *Samythopsis*, *Grubianella*, and others come from profound depths. But it must be remembered that much as the memorable voyage of the Challenger has added to our knowledge in this respect, still more remains to be accomplished in the vast oceanic areas. If the deepest abysses have produced in the present instance known genera, it is probable that further research will enlarge the areas to which the new genera are limited. It is also noteworthy in connection with the Annelids obtained from the profound abysses, that the majority are tube-dwellers, and thus are more or less protected, though at the same time this fact renders their presence in the trawl or dredge more frequent.

10 fathoms and under.

Euphrosyne capensis.
Amphinome rostrata (surface).
Hermodice carunculata.
Eurythoë pacifica.
var. *levukaensis.*
Hipponoë gaudichaudi (surface).
Hermione hystrix.
Lepidonotus wahlbergi.
cristatus.
Eunoa capensis.
Polynoë pustulata.
attenuata.
Eupompe australiensis.
Leanira lævis.
Nephthys atlantica.
Phyllodoce sancti-vincentis.
Eulalia capensis.
Alciopa antarctica.
quadrioculata.
Alciopa sp. } surface.
Halodora reynaudii.
Greeffia oahuensis.
Hesione assimilis.
Hesione sp.
Nereis melanocephala.
Notocirrus capensis.
Palolo viridis.
Nematonereis sp.
Eunice torresiensis.
vittata, var.
cirrobranchiata.
aphroditois.
torquata.
barvicensis.
tribranchiata.
Eone trifida.
Glycera lamelliformis.
Aricia platycephala.
Trophonia capensis.
Brada whiteavesii.
Cirratulus capensis.
Nicomache capensis.
Sabellaria johnstoni.
capensis.
Terebella crassicornis.
Schmardanella pterochæta.
Thelepus sp.
Sabella bipunctata.
fusca.
Dasychone bairdi.
orientalis.
wyvillei.
nigro-maculata.
violacea.

10 to 50 fathoms.

Chloeia flava.
fusca.
Notopygos megalops.
Aphrodita australis.
Palmyra aurifera.
Lepidonotus gymnodactus.
Lagisca tenuisetis.
peracuta.
Evarne kerguelensis.
tenuisetis.
Polynoë platycirrata.
ocellata.
Thalenessa ocalata.
digitata.
fimbriata.
Lætmira japonicensis.
Hesione pacifica.
Autolytus macleayanus.
Nereis brasiliensis.
kobiensis.
Nereis tongatabuensis.
catenei.
Staurocephalus australiensis.
Lumbriconereis heteropoda.
Eunice kobiensis.
norvegi.
equibranchiata.
bassensis.
Glycera amboinensis.
Ammotrypane gracile.
Travisia kerguelensis.
Brada [illegible].
Phyllochaetopterus claparedii.
Dasybranchus sp.
Sabellaria giardi.
Terebella setigera.
Pista fasciata.
Artacama challengeriæ.
Dasychone picta.
japonica.
Hydroides multispinosa.

50 to 100 fathoms.

Euphrosyne borealis.
Notopygos labiatus.
Lagisca yokoluamaensis.
Polynoë hexactinellidæ.
Harmothoë haliaëti.
Eupolynoë mollis.
Hermadion kerguelensis.
Polynoë cuplectellæ.
capensis.
iphionoides.
Eupholoë philippensis.
Nephthys trissophyllus (and 20 fathoms).
Syllis capensis.
Syllis gigantea.
Eusyllis tubifex.
Exogone heterosetosa.
Nereis pelagica.
kerguelensis.
patagonica.
Notocirrus capensis.
Eunice mandanavensis.
Nothria willemoesii.
Glycera tessellata.
capitata.
Scalibregma inflatum.
Ranzania capensis.
Prionospio capensis.

50 to 100 fathoms—*continued.*

Cirratulus zebuensis.
Praxilla capensis.
Phyllocomus croceus.
Amphitrite kerguelensis.
Thelepus cincinnatus, var. *canadensis.*
Nevottis antarctica.
Artacama zebuensis.
Potamilla torelli.
Sabella zebuensis.
Branchiomma vesiculosum.
Protula americana.
Serpula narconensis.
Ditrypa arietina.

100 to 200 fathoms.

Aphrodita echidna.
Lætmonice producta.
Euphione elisabethæ.
Eunoa mindanavensis.
Lagisca antarctica.
magellanica.
darwini.
Phyllodoce duplex.
Salvatoria kerguelensis.
Sphærosyllis kerguelensis.
Syllis ramosa.
Lumbriconereis kerguelensis.
Eunice edwardsi.
pycnobranchiata.
Glycera kerguelensis.
Scoloplos kerguelensis.
Trophonia kerguelarum.
Scolecolepis cirrata.
Praxilla köllikeri.
kerguelensis.
assimilis.
Ampharete kerguelensis.
Terebella grubei.
flabellum (and to 50 fathoms).
Ereutho kerguelensis.
Polycirrus kerguelensis.
Terebellides stræmi, var.
Dasychone capensis.
Protula capensis.
Apomatus elisabethæ.
Serpula narconensis, var. *magellanica.*
Pomatocerus strigiceps.
Spirorbis sp.

200 to 500 fathoms.

Lætmonice japonica.
Aphrodita intermedia.
Iphionella cimex.
Lepidonotus squamatus.
Eunoa iphionoides.
opalina.
yedoensis.
Polyeunoa levis.
Lagisca magellanica, var. *murrayi.*
var. *grubei.*
Allmaniella setubalensis.
Scalisetosus ceramensis.
Eulepis wyvillei.
challengeriæ.
Sigalion buskii.
Psammolyce occidentalis.

10 to 50 fathoms.

Chloeia flava.
fusca.
Notopygos megalops.
Aphrodita australis.
Palmyra aurifera.
Lepidonotus gymnonotus.
Lagisca tenuisetis.
peracuta.
Evarne kerguelensis.
tenuisetis.
Polynoë platycirrata.
ocellata.
Thalenessa oculata.
digitata.
fimbriata.
Leanira japanensis.
Hesione pacifica.
Autolytus maclearanus.
Nereis brasiliensis.
kobiensis.
Nereis tongatabuensis.
eatoni.
Staurocephalus australiensis.
Lumbriconereis heteropoda.
Eunice kobiensis.
murrayi.
equibranchiata.
bassensis.
Glycera amboinensis.
Ammotrypane gracile.
Travisia kerguelensis.
Brada mammillata.
Phyllochætopterus claparedii.
Dasybranchus sp.
Sabellaria giardi.
Terebella seticornis.
Pista fasciata.
Artacama challengeriæ.
Dasychone picta.
japonica.
Hydroides multispinosa.

50 to 100 fathoms.

Euphrosyne borealis.
Notopygos labiatus.
Lagisca yokohamiensis.
Polynoë hexactinellidæ.
Harmothoë haliaëti.
Eupolynoë mollis.
Hermadion kerguelensis.
Polynoë euplectellæ.
capensis.
iphionoides.
Eupholoë philippensis.
Nephthys trissophyllus (and 20 fathoms).
Syllis capensis.
Syllis gigantea.
Eusyllis tubifex.
Exogone heterosetosa.
Nereis pelagica.
kerguelensis.
patagonica.
Notocirrus capensis.
Eunice mandanavensis.
Nothria willemoesii.
Glycera tessellata.
capitata.
Scalibregma inflatum.
Ranzania capensis.
Prionospio capensis.

50 to 100 fathoms—*continued.*

Cirratulus zebuensis.
Praxilla capensis.
Phyllocomus croceus.
Amphitrite kerguelensis.
Thelepus cincinnatus, var. *canadensis.*
Neottis antarctica.
Artacama zebuensis.
Potamilla torelli.
Sabella zebuensis.
Branchiomma vesiculosum.
Protula americana.
Serpula narconensis.
Ditrypa arietina.

100 to 200 fathoms.

Aphrodita echidna.
Lætmonice producta.
Euphione elisabethæ.
Eunoa mindanavensis.
Lagisca antarctica.
magellanica.
darwini.
Phyllodoce duplex.
Salvatoria kerguelensis.
Sphærosyllis kerguelensis.
Syllis ramosa.
Lumbriconereis kerguelensis.
Eunice edwardsi.
pycnobranchiata.
Glycera kerguelensis.
Scoloplos kerguelensis.
Trophonia kerguelarum.
Scolecolepis cirrata.
Praxilla köllikeri.
kerguelensis.
assimilis.
Ampharete kerguelensis.
Terebella grubei.
flabellum (and to 50 fathoms).
Ereutho kerguelensis.
Polycirrus kerguelensis.
Terebellides stræmi, var.
Dasychone capensis.
Protula capensis.
Apomatus elisabethæ.
Serpula narconensis, var. *magellanica.*
Pomatocerus strigiceps.
Spirorbis sp.

200 to 500 fathoms.

Lætmonice japonica.
Aphrodita intermedia.
Iphionella cimex.
Lepidonotus squamatus.
Eunoa iphionoides.
opalina.
yedoensis.
Polyeunoa levis.
Lagisca magellanica, var. *murrayi.*
var. *grubei.*
Allmaniella setubalensis.
Scalisetosus ceramensis.
Eulepis wyvillei.
challengeriæ.
Sigalion buskii.
Psammolyce occidentalis.

STATION 209. Off Zebu; lat. 10° 14′ N., long. 123° 54′ E.; 95 fathoms; blue mud (dredged).

Lagisca hexactinellidæ, n. sp.
Polynoë (*Langerhansia*) *euplectellæ*, n. sp.
Syllis ramosa, M'Intosh, D.
Cirratulus zebuensis, n. sp.
Artacama zebuensis, n. sp.
Sabella zebuensis, n. sp.

STATION 214. South of Mindanao; lat. 4° 33′ N., long. 127° 6′ E.; 500 fathoms; blue mud (trawled).

Iphionella cimex, De Quatrefages.
Genetyllis oculata, n. sp.

STATION 232. South of Yedo, Japan; lat. 35° 11′ N., long. 139° 28′ E.; 345 fathoms; green mud (dredged).

Lætmonice japonica, n. sp.
Eunoa yedoensis, n. sp.
Leanira areolata, n. sp.
Lumbriconereis bifurcata, n. sp.
japonica, Marenzeller.
Nothria macrobranchiata, n. sp.
Maldane sarsi, Malmgren.
Nicomache japonica, n. sp.
Praxilla lankesteri, n. sp.
Amphicteis japonica, n. sp.

Off Japan; lat. 33° 56′ N., long. 130° 27′ E.; 30 fathoms.

Ammotrypane gracile, n. sp.

STATION 233A. Near Kobé, Japan; lat. 34° 38′ N., long. 135° 1′ E.; 50 fathoms; sand (dredged).

Palmyra aurifera, Savigny (?).
Lepidonotus gymnonotus, Marenzeller.
Polynoë ocellata, n. sp.
Leanira japanensis, n. sp.
Nereis (*Platynereis*) *kobiensis*, n. sp.
Eunice kobiensis, n. sp.
Phyllochætopterus claparedii, n. sp.
Pista fasciata, (Grube).
Dasychone picta, n. sp.
japonica, n. sp.
Hydroides multispinosa, Marenzeller.

STATION 233B. South of Japan; lat. 34° 18′ N., long. 133° 35′ E.; 15 fathoms; blue mud (trawled).

Chloeia flava, Pallas.
Dasybranchus sp.

Station 235. South of Yedo, Japan: lat. 34° 7′ N., long. 138° 0′ E.; 565 fathoms; green mud (trawled).

Lætmonice aphroditoides, n. sp. | *Polynoëlla levisetosa*, n. sp.

Station 236. South Japan: lat. 34° 58′ N., long. 139° 29′ E.; 775 fathoms; green mud (trawled).

Thelepus marenzelleri, n. sp.

Off Yokohama, Japan; 550 fathoms.

Lagisca yokohamiensis, n. sp. | *Lumbriconereis heteropoda*, Marenzeller.

Station 241. North Pacific; lat. 35° 41′ N., long. 157° 42′ E.; 2300 fathoms; red clay (trawled).

Lætmonice producta, var. *benthaliana*, C. | *Nicomache benthaliana*, n. sp.
| *Eusamytha pacifica*, n. sp.

Station 244. Depths of the Pacific; lat. 35° 22′ N., long. 169° 53′ E.; 2900 fathoms; red clay (trawled).

Placostegus ornatus, Sowerby.

Station 246. Mid Pacific; lat. 36° 10′ N., long. 178° 0′ E.; 2050 fathoms; Globigerina ooze (trawled).

Melinna pacifica, n. sp.

F. North Pacific Region.

Comparatively few Annelids come from this region, but three out of the five are surface forms of interest (Alciopidæ). The members of this family thus frequent the superficies of all the great seas, from the Arctic to the Antarctic Oceans, and from the eastern to the western shores of the Americas. Prof. Huxley's remark that it is doubtful whether any well marked provinces of the ocean can be defined by the occurrence of purely pelagic animals thus still holds.

As to the causes which have led to the relegation of such peculiar forms as *Buskiella* to the remote abysses of the Atlantic, and of *Leœna abyssorum* and *Placostegus benthalianus* to the depths of the North Pacific, various opinions may be held. We have no reliable data in support of the view which supposes that these "primitive" types have

been gradually pressed by the more prolific and hardier shallow-water forms deeper and deeper into the ocean. In the case of *Leæna* and *Placostegus*, again, both are members of genera not unknown in comparatively shallow water, and even between tide-marks.

Station 253. Mid Pacific; lat. 38° 9′ N., long. 156° 25′ W.; 3125 fathoms; red clay (dredged).

Leæna abyssorum, n. sp. | *Placostegus benthalianus*, n. sp.

Surface of the sea at Honolulu.

Alciopa quadrioculata, n. sp. | *Alciopa* sp. (?).
Greeffia oahuensis, n. sp.

G. South Pacific Region.

The majority of the specimens from this area come from the Strait of Magellan; the confined waters of which seem to be favourable for their development. Of characteristic forms the most striking are *Aphrodita echidna*, De Quatrefages, two species of *Lagisca*, *Eunoa opalina*, *Leanira magellanica*, *Eunice*, *Nothria*, *Hemipodus*, *Samythopsis*, *Eupista*, and *Euthelepus*.

Station 272. Mid Pacific; lat. 3° 48′ S., long. 152° 56′ W.; 2600 fathoms; Radiolarian ooze (trawled).

Myriochele pacifica, n. sp.

Off Tetuaroa Islands.

Glycera sagittariæ, n. sp.

Station 285. Pacific; lat. 32° 36′ S., long. 137° 43′ W.; 2375 fathoms; red clay (trawled).

Placotegus mörchii, n. sp.

Station 298. Off the west coast of South America; lat. 34° 7′ S., long. 73° 56′ W.; 2225 fathoms; blue mud (trawled).

Lumbriconereis abyssorum, n. sp. | *Maldanella valparaisiensis*, n. sp.
Nothria pycnobranchiata, n. sp. | *Samythopsis grubei*, n. sp.
ehlersi, n. sp. | *Eupista darwini*, n. sp., A.

STATION 299. Off Valparaiso; lat. 33° 31′ S., long. 74° 43′ W.; 2160 fathoms; blue mud (trawled).

Euthelepus chilensis, n. sp.

STATION 302. West of Patagonia; lat. 42° 43′ S., long. 82° 11′ W.; 1450 fathoms; Globigerina ooze (trawled).

Vermilia sp.

STATION 306A. Strait of Magellan; lat. 48° 27′ S., long. 74° 30′ W.; 345 fathoms; blue mud (trawled).

Leanira magellanica, n. sp. | *Hemipodus magellanicus*, n. sp.

STATION 307. Strait of Magellan; lat. 49° 24′ S., long. 74° 23′ W.; 140 fathoms; blue mud (trawled).

Aphrodita echidna, De Quatrefages.

STATION 308. Strait of Magellan; lat. 50° 8′ S., long. 74° 41′ W.; 175 fathoms; blue mud (trawled).

Lagisca magellanica, n. sp.
darwini, n. sp.
Eunice magellanica, n. sp. | *Serpula narconensis*, Baird, var. *magellanica*, nov., C.

STATION 310. Strait of Magellan; lat. 51° 27′ S., long. 74° 3′ W.; 400 fathoms; blue mud (trawled).

Lagisca magellanica n. sp., var. *murrayi*, nov.

STATION 311. Strait of Magellan; lat. 52° 45′ S., long. 73° 46′ W.; 245 fathoms; blue mud (trawled).

Eunoa opalina, n. sp.

STATION 313. Strait of Magellan; lat. 52° 20′ S., long. 67° 39′ W.; 55 fathoms; sand (trawled).

Nereis patagonica, n. sp.

BATHYMETRICAL DISTRIBUTION.

In regard to bathymetrical distribution, the greatest number of species occur in the shallow water (10 fathoms and under), probably because much work was done in this region in the pinnace, especially in rich localities, and also because the opportunities for collecting between tide-marks were fully taken advantage of; moreover, the surface-forms are included in this division. The two regions ranging from 10 to 50 fathoms and from 50 to 100 fathoms have each about the same number of Annelids, and both are similar in respect to new forms. In the three areas just mentioned, the known species are fairly represented, though the majority are new. The number between 100 and 200 fathoms is less than the foregoing, but the proportion of new forms is much higher, and several are of considerable interest, *e.g.*, *Syllis ramosa*. In the rich region ranging from 200 to 500 fathoms, very few known forms break the long list (the second of the series) of novel Annelids. About five new genera are included, and the remarkable types are exemplified by *Allmaniella*, *Scalisetosus*, *Eulepis*, *Genetyllis oculata*, *Macduffia*, *Hemipodus*, and *Euthelepus*. The number of species at this depth, however, may be partly due to the more frequent dredging therein. Between 500 and 600 fathoms the number falls to less than half that in the previous group, but the majority are new. The number found between 600 and 1000 fathoms include two known species out of a list of fourteen.

The four species occurring between 1000 and 1200 fathoms are new. Those between 1200 and 1500 fathoms are more than five times as numerous as the last, and include only five known forms, most of which, however, are found in shallow water as well as at this great depth, *e.g.*, *Eunice ærstedi*, *Aricia norvegica*, *Amphicteis gunneri*, and *Terebellides strœmi*, the latter three, besides, having a very wide geographical range. About the same number were procured between 1500 and 2000 fathoms. All are new, and three new genera required to be formed.

Between 2000 and 2500 fathoms the total numbers about half that just mentioned (between 1500 and 2000 fathoms), and all are new, while four new genera are present in the series. In the region between 2500 and 3000 fathoms several known forms occur, viz., *Lætmonice producta*, a marked variety (*benthaliana*) of which, however, only is found at this depth, *Myriochele heeri*, *Amphicteis gunneri* (var. *atlantica*), and *Placostegus ornatus*. If the diagnosis be correct, the latter was first procured by Sowerby in shallow water in the Philippines. The two forms from the profound abyss of 3125 fathoms are new, though the genera are well known.

In glancing over the lists, and excluding the pelagic types, it is evident that no definite law as to the presence or absence of genera at particular depths, can be enunciated, though it is true that such genera as *Leæna*, *Eupista*, *Euthelepus*, *Melin-*

nopsis, *Eusamytha*, *Samythopsis*, *Grubianella*, and others come from profound depths. But it must be remembered that much as the memorable voyage of the Challenger has added to our knowledge in this respect, still more remains to be accomplished in the vast oceanic areas. If the deepest abysses have produced in the present instance known genera, it is probable that further research will enlarge the areas to which the new genera are limited. It is also noteworthy in connection with the Annelids obtained from the profound abysses, that the majority are tube-dwellers, and thus are more or less protected, though at the same time this fact renders their presence in the trawl or dredge more frequent.

10 fathoms and under.

Euphrosyne capensis.
Amphinome rostrata (surface).
Hermodice carunculata.
Eurythoë pacifica.
Eurythoë pacifica, var. *levukaensis.*
Hipponoë gaudichaudi (surface).
Hermione hystrix.
Lepidonotus wahlbergi.
Lepidonotus cristatus.
Eunoa capensis.
Polynoë pustulata.
Polynoë attenuata.
Eupompe australiensis.
Leanira lævis.
Nephthys atlantica.
Phyllodoce sancti-vincentis.
Eulalia capensis.
Alciopa antarctica.
Alciopa quadrioculata.
Alciopa sp. } surface.
Halodora reynaudii.
Greeffia oahuensis.
Hesione assimilis.
Hesione sp.
Nereis melanocephala.
Notocirrus capensis.
Palolo viridis.
Nematonereis sp.
Eunice torresiensis.
Eunice vittata, var.
Eunice cirrobranchiata.
Eunice aphroditois.
Eunice torquata.
Eunice barvicensis.
Eunice tribranchiata.
Eone trifida.
Glycera lamelliformis.
Aricia platycephala.
Trophonia capensis.
Brada whiteavesii.
Cirratulus capensis.
Nicomache capensis.
Sabellaria johnstoni.
Sabellaria capensis.
Terebella crassicornis.
Schmardanella pterochæta.
Thelepus sp.
Sabella bipunctata.
Sabella fusca.
Dasychone bairdi.
Dasychone orientalis.
Dasychone wyvillei.
Dasychone nigro-maculata.
Dasychone violacea.

10 to 50 fathoms.

Chloeia flava.
fusca.
Notopygos megalops.
Aphrodita australis.
Palmyra aurifera.
Lepidonotus gymnonotus.
Lagisca tenuisetis.
peracuta.
Evarne kerguelensis.
tenuisetis.
Polynoë platycirrata.
ocellata.
Thalenessa oculata.
digitata.
fimbriata.
Leanira japanensis.
Hesione pacifica.
Autolytus maclearanus.
Nereis brasiliensis.
kobiensis.
Nereis tongatabuensis.
eatoni.
Staurocephalus australiensis.
Lumbriconereis heteropoda.
Eunice kobiensis.
murrayi.
equibranchiata.
bassensis.
Glycera amboinensis.
Ammotrypane gracile.
Travisia kerguelensis.
Brada mammillata.
Phyllochætopterus claparedii.
Dasybranchus sp.
Sabellaria giardi.
Terebella seticornis.
Pista fasciata.
Artacama challengeriæ.
Dasychone picta.
japonica.
Hydroides multispinosa.

50 to 100 fathoms.

Euphrosyne borealis.
Notopygos labiatus.
Lagisca yokohamiensis.
Polynoë hexactinellidæ.
Harmothoë haliaëti.
Eupolynoë mollis.
Hermadion kerguelensis.
Polynoë euplectellæ.
capensis.
iphionoides.
Eupholoë philippensis.
Nephthys trissophyllus (and 20 fathoms).
Syllis capensis.
Syllis gigantea.
Eusyllis tubifex.
Exogone heterosetosa.
Nereis pelagica.
kerguelensis.
patagonica.
Notocirrus capensis.
Eunice mandanavensis.
Nothria willemoesii.
Glycera tessellata.
capitata.
Scalibregma inflatum.
Ranzania capensis.
Prionospio capensis.

50 to 100 fathoms—*continued.*

Cirratulus zebuensis.
Praxilla capensis.
Phyllocomus croceus.
Amphitrite kerguelensis.
Thelepus cincinnatus, var. *canadensis.*
Neottis antarctica.
Artacama zebuensis.
Potamilla torelli.
Sabella zebuensis.
Branchiomma vesiculosum.
Protula americana.
Serpula narconensis.
Ditrypa arietina.

100 to 200 fathoms.

Aphrodita echidna.
Lætmonice producta.
Euphione elisabethæ.
Eunoa mindanavensis.
Lagisca antarctica.
magellanica.
darwini.
Phyllodoce duplex.
Salvatoria kerguelensis.
Sphærosyllis kerguelensis.
Syllis ramosa.
Lumbriconereis kerguelensis.
Eunice edwardsi.
pycnobranchiata.
Glycera kerguelensis.
Scoloplos kerguelensis.
Trophonia kerguelarum.
Scolecolepis cirrata.
Praxilla köllikeri.
kerguelensis.
assimilis.
Ampharete kerguelensis.
Terebella grubei.
flabellum (and to 50 fathoms).
Ereutho kerguelensis.
Polycirrus kerguelensis.
Terebellides stræmi, var.
Dasychone capensis.
Protula capensis.
Apomatus elisabethæ.
Serpula narconensis, var. *magellanica.*
Pomatocerus strigiceps.
Spirorbis sp.

200 to 500 fathoms.

Lætmonice japonica.
Aphrodita intermedia.
Iphionella cimex.
Lepidonotus squamatus.
Eunoa iphionoides.
opalina.
yedoensis.
Polyeunoa levis.
Lagisca magellanica, var. *murrayi.*
var. *grubei.*
Allmaniella setubalensis.
Scalisetosus ceramensis.
Eulepis wyvillei.
challengeriæ.
Sigalion buskii.
Psammolyce occidentalis.

200 to 500 fathoms—*continued.*

Leanira magellanica.
areolata.
Nephthys malmgreni.
Genetyllis oculata.
Syllis setubalensis.
brasiliensis.
Nematonereis schmardæ.
Lumbriconereis bifurcata.
japonica.
Eunice magellanica.
prognatha.
Macduffia bonhardi.
Nothria sombreriana, and var.
macrobranchiata.
Hemipodus magellanicus.
Scolecolepis cirrata, var.
Chætozone atlantica.
Notomastus grubei.
Maldane sarsi.
Nicomache japonica.
Maldane atlantica.
Praxilla challengeriæ.
Ampharete sombreriana.
Amphicteis japonica.
Melinna maculata.
Euthelepus setubalensis.
Terebellides ehlersi.
Protula lusitanica.
Serpula sombreriana.
Placostegus assimilis.
Spirobranchus occidentalis.

500 to 600 fathoms.

Aphrodita aculeata.
Lætmonice filicornis.
aphroditoides.
Dasylepis equitis.
Lagisca propinqua.
kermadecensis.
Eulagisca corrientis.
Evarne johnstoni.
Lænilla fusca.
Polynoë magnipalpa.
Polynoella levisetosa.
Syllis robertianæ.
Nicidon balfouriana.
Nothria quadricuspis.
Hyalinœcia tubicola, var.
Terebella kermadecensis.
Pista mirabilis.
corrientis.
Sabella assimilis.

600 to 1000 fathoms.

Polynoë mirabilis.
Leanira hystricis.
Staurocephalus atlanticus.
Lumbriconereis neo-zealaniæ.
Nothria tenuisetis.
conchylega.
minuta.
Chætozone pacifica.
Praxilla sp.
Terebella sp.
Lanassa sarsi.
Thelepus marenzelleri.
Ehlersiella atlantica.
Terebellides sp.

1000 to 1200 fathoms.

Eumenia reticulata.
Melinna armandi.
Lœna neo-zealaniæ.
langerhansi.

1200 to 1500 fathoms.

Harmothoë benthaliana.
Polynoë synophthalma.
longipedata.
Nephthys phyllobranchia.
Laranda longa.
Lumbriconereis punctata.
ehlersi.
Eunice ærstedi (to 83 fathoms).
Aricia norvegica.
Chætozone benthaliana.
Notomastus agassizii.
Maldanella antarctica.
neo-zealaniæ.
Nicomache benthaliana.
Maldane sp.
Praxilla occidentalis.
Myriochele heeri.
Amphicteis gunneri.
Thelepus sp.
Terebellides stræmi.
Serpula philippensis.
Vermilia sp.

1500 to 2000 fathoms.

Chloenea atlanticæ.
Lætmonice producta, var. *wyvillei* (and to 50 fathoms).
Lætmonice producta, var. *willemoesii* (to 700 fathoms).
Lagisca moseleyi.
crosetensis.
Dalhousia atlantica.
Nereis longisetis.
Nothria abranchiata.
armandi.
Nothria benthaliana.
Ephesia antarctica.
Trophonia wyvillei.
Maldane malmgreni.
Praxilla abyssorum.
Petta assimilis.
Amphicteis sarsi.
Grubianella antarctica, and var.
Melinnopsis atlantica.
Pista abyssicola.
Leæna antarctica.

2000 to 2500 fathoms.

Lumbriconereis abyssorum.
Nothria pycnobranchiata.
ehlersi.
Maldanella valparaisiensis.
Samythopsis grubei.
Eusamytha pacifica.
Melinna pacifica.
Euthelepus chilensis.
Placostegus mörchii.

2500 to 3000 fathoms.

Lætmonice producta, var. *benthaliana* (to 1600 fathoms).
Eunoa abyssorum.
Polynoë ascidioides.
Buskiella abyssorum (to 1850 fathoms).
Myriochele heeri.
Myriochele pacifica.
Amphicteis gunneri, var. *atlantica.*
sarsi.
Eupista darwini (to 2225 fathoms).
grubei.
Lanassa benthaliana.
Placostegus ornatus.
Serpula sp.

3125 fathoms.

Leæna abyssorum.
Placostegus benthalianus.

DESCRIPTION OF GENERA AND SPECIES.

Family Euphrosynidæ.

The Euphrosynidæ, as the first group of his Amphinomea, have been so clearly indicated by Ehlers,[1] that at present they stand in no need of further notice. Their short ovoid form—hirsute with the characteristic bristles, rows of dorsal branchiæ, and the caruncular head—is diagnostic.

The Challenger was fortunate in procuring two species, for as their haunts are often littoral, they would thus seldom come under observation. A single species was found by Kinberg and Schmarda, since the *Euphrosyne polybranchia* of the latter is undoubtedly synonymous (as Ehlers states) with Kinberg's *Euphrosyne capensis*. Grube gives none in his Annulata Œrstediana, nor in the account of the Annelids of the German exploring ship "Gazelle," and only one (*Euphrosyne aurifera*) in Semper's fine series from the Philippines. In the "Novara" collection he found the same species as Kinberg and Schmarda. One form also is noted by Marenzeller[2] from southern Japan.

Euphrosyne, Savigny.

Euphrosyne capensis, Kinberg (Pl. II. fig. 5; Pl. Ia. figs. 1–3).

Euphrosyne capensis, Kinberg, Öfversigt k. Vetensk.-Akad. Förhandl., d. 14 Januari 1857, Stockh., 1858, p. 14; and Fregatten Eugenies Resa, 1858, taf. 12, fig. 14.

Euphrosyne polybranchia, Schmarda, Neue wirbellose Thiere, vol. i. part 2, 1861, p. 136, taf. 32, figs. 264–287.

Body rather more than usually elongate, somewhat fusiform, and of a reddish-orange colour. The caruncle, consisting of an elevated keel and a flat band, reaches to the eighth segment, and a short and somewhat stout conical tentacle exists in front of the ridge, with a well-marked eye at each side of the latter anteriorly. A pair of much more minute and in some nearly confluent eyes occurs on the ventral surface of the narrow cephalic ridge. The arborescent branchiæ are purplish, with the elliptical or sub-oval tips pale reddish, and each complete row generally consists of eleven trunks. The bifid dorsal bristles are of

[1] Die Borstenwürmer, i. p. 64 *et. seq.*

[2] *Denkschr. d. k. Akad. d. Wiss. Wien*, Bd. xli., 1879, p. 2 (sep. Abd.).

two kinds—smooth and crenated in the fissure, while the bifid ventral bristles are all smooth. There are about fifty-seven segments. Length, 45 mm.; breadth, 12 mm.

Habitat.—Under stones between tide-marks at Sea Point, near Cape Town, South Africa, November 1873.

The species seems to be tolerably abundant at the Cape, and it is noteworthy that it was the only one procured by Kinberg and Schmarda in their well-known travels. It is evident that both refer to the same form, as Prof. Ehlers[1] more than suspected, and consequently Kinberg's name has the priority. It belongs to the first group of Ehlers, viz., those having the sides of the segments furnished with both cirri and branchiæ, all the latter, moreover, being ramose. Grube describes the same species from St. Paul, in his account of the Annelids of the "Novara" Expedition.[2]

The body of *Euphrosyne capensis* is proportionally longer, more finely spinose and more flattened than that of the British *Euphrosyne foliosa*. Kinberg observes that the caruncle is semiglobose anteriorly—a feature that has not been seen in these examples. Schmarda, again, describes and figures seven tentacles (Fühler) in connection with the caruncle, but such apparently is a misapprehension. None showed any trace of the rudimentary clavate tentacles observed by Ehlers in his *Euphrosyne racemosa*. In front of the puckered opening of the mouth are the two kidney-shaped pads, separated by a deep median fissure. These pads are probably of some importance as pivots during the complex actions of the buccal apparatus. A typical segment of the body consists of a convex dorsal and a flattened ventral arch. The former is bare in the middle line, but has laterally a superior division carrying a dense series of bristles and a posterior row of the branchiæ, with a cirrus at the dorsal margin and another midway between the bristles and the branchiæ. The latter is the longer and shows a slight constriction in the middle, but neither tapers much. The inferior division, again, presents a tuft of bristles, and inferiorly and posteriorly a cirrus, which is generally more slender at the tip than either of the foregoing. All the cirri are shorter and stouter than in *Euphrosyne foliosa*. The dorsal row of bristles is comparatively short when contrasted with *Euphrosyne borealis*, and even less boldly marked than in *Euphrosyne foliosa*; while their apertures in the thick cuticle appear as if punched out. Kinberg's figure is a very fair, though not quite accurate, representation of the serrated kind, while Schmarda's deviates still further from nature. The curve of the tip (Pl. Ia. fig. 1) is less pronounced than in *Euphrosyne foliosa*, and the disproportion between the processes better marked. When viewed antero-posteriorly, the notches on the limbs of the fork are observed to be due to transverse grooves. At the dorsal edge as well as in the centre of the row many with a smooth fork occur (Pl. Ia. fig. 2), the long process being much attenuated. All the smooth bristles project considerably beyond the

[1] Die Borstenwürmer, i., 1864, p. 65.
[2] Annel. Novara Exped., p. 6 (sep. Abd.).

serrated kind. M. Claparède[1] has drawn attention to the special characters of the bristles in *Euphrosyne*, viz., their extreme brittleness, their tubular structure, calcareous nature, and the entrance of air into the interior. The same features have been noticed in *Chloeia*.[2] Schmarda also mentions the occurrence of a yellow fluid in the central canal of the present form. Nothing has been seen to verify his statement that a network of slightly curved bristles, pointed at both ends (fusiform-acerate, Bowerbank), exists at the lower border of the branchiæ. His figures very much resemble sponge-spicules. The ventral bristles (Pl. Ia. fig. 3) are considerably larger than the dorsal, and are terminated by a slightly curved blunt tip, with a conical spike at the base. The internal canals from the processes join after a short course downward, and there is a slight dilatation of the cavity opposite the enlargement at the upper third of the shaft.[3]

The dorsal region of each segment is further supplied with a densely ramose series of branchial processes, which are eleven in number in the typical segments. Schmarda says there are twelve, but such a discrepancy is of little importance. Each is dichotomously branched, and the tips end in a series of elliptical or sub-oval bodies somewhat like those in *Euphrosyne foliosa*. The superior are the longer. So far as can be observed in sections of the organs, the view of M. Claparède—that these structures are entirely devoid of an axial cavity, if we exclude from this term the blood-vessels—seems to be correct, especially as regards the distal branches. This author, indeed, thought that the general surface of the body exercised the function of respiration. On the other hand, it requires very little manipulation to trace the large blood-vessels from the body-cavity into the branchiæ and follow their branches up to (but not into) the tips of the organs. In sections of the base of the trunks a complex series of muscular fibres appear, and the cuticle and hypoderm of the entire structure are dense except distally, where the former becomes very thin.

In the structure of the body-wall this form agrees with its congeners. The nerve-cords have superiorly a firm investment which is continuous from side to side. In the hollow between them superiorly is a fascicle of muscular fibres, and below them a central granular structure. Moveover, the cords are united by a streaked isthmus inferiorly. The anatomy of one region of this form is especially interesting, viz., that of the buccal apparatus. The anterior part of the structure consists of a cylindrical protrusible proboscis densely covered with cuticle. The centre of the latter in front is occupied by a large muscular and vascular, but chiefly glandular mass, the inner lining of which is thrown into bold longitudinal rugæ. The vast collection of glands in this organ would indicate

[1] Ann. Chétop. du Golfe de Naples, p. 109.

[2] "Porcupine" Annelids, *Trans. Zool. Soc. Lond.*, vol. ix. p. 396.

[3] A remarkable and apparently new form in the British Museum shows the peculiarity of having along with the ordinary forked ventral bristles a dense series of long slender dotted hairs tapering to a tip which is slightly bulbous. The dorsal serrated forms are very boldly marked, and the smooth ones are long. The branchiæ are much branched, and the tips somewhat lanceolate. The species is fully an inch in length, and comes from the Pascadores Islands—Consul Swinhoe's Collection (70, 6, 18, 13).

important secerning functions. Behind is a remarkable lingual organ, which in longitudinal section presents much resemblance to the tongue in mammals. It is attached at the base posteriorly to a dense glistening muscular mass—separated by a layer of horizontal fibres from the complex series of radiating muscles which diverge upward to the periphery of the organ. In vertical longitudinal sections in the middle line these fibres are separated posteriorly, by septa passing downward from the thick cuticular (chitinous) coat, into spaces that enlarge as we proceed anteriorly. In such sections most of the fibres in the posterior half are more or less vertical, though it is evident they are closely interwoven. The muscles at the tip of the tongue arch backward over the posterior part of the preceding glandular region (which forms a highly vascular cushion), and pass downward to the front of the dense glistening basal mass formerly alluded to—the curve of the arch becoming less and less till the fibres are nearly vertical behind the cushion, or at the commencement of the smooth and dense cuticular region of the tongue. The chitinous cuticular surface of the organ is so largely developed at this part that it is as thick as the hypodermic layer. In this region also there are at least three strong plates of transverse muscular fibres extending from summit to base. If the section deviate to the lateral regions, the decussation of the fibres is extremely complex. In transverse sections, again, near the tip of the tongue, the thickness of the hypoderm on the rugæ of the prelingual mass as well as in the lingual papillæ is considerable. Moreover, it is apparent that the entire diameter at the base of the prelingual mass is formed on the same plan, the central region (lingua proper) being, however, most muscular. When the section passes through the thick mass of the tongue an inextricable series of crossed and interwoven fibres occurs, the base assuming a somewhat stratified appearance, since the numerous blood-vessels are situated at intervals in regular horizontal rows. Nothing can exceed the complexity of the muscular structure of the organ, which is thus eminently calculated to subserve very important functions. The tip of the tongue is highly vascular; indeed, the organ throughout is largely supplied with blood-vessels. The dorsum of the free tip is covered by a series of elevated papillæ—truncated at the tip, and with one angle pointed—composed of processes of the hypoderm sheathed in cuticle. Schmarda describes a series of small blackish horny teeth as situated on the ridges of the vault of the proboscis, but, in the present instance, nothing further than the hypodermic longitudinal furrows covered with cuticle have been observed. Ehlers found similar ridges in *Euphrosyne racemosa*, but in the latter as well as in the *Euphrosyne foliosa* of Britain the parts are less developed than in the large African form.

Behind the tongue the alimentary region presents on its ventral aspect a large and a small fold, the former in longitudinal section often having a broad summit applied to the vault of the canal and a narrow base so that the whole resembles a pedicled mass, but it varies according to the condition of the spirit-preparations. This region is furnished with numerous transverse folds, so deep in some cases as to

merit the name of lamellæ (like those in the ruminant's "manyplies"). The canal then bends upward (from the posterior pit) and forms a kind of pylorus, with thick walls and bold longitudinal furrows, and terminates in the intestine, into which the part freely projects like a long os uteri into a vagina. The thick rugose intestine, which agrees in structure with that in the ordinary Annelids, terminates in a dorsal anus, with two styloid processes, of the usual shape, at the sides inferiorly. None of the specimens presented developed generative organs, which in the British examples from Herm are in full maturity in August. Claparède mentions that they originate at the bases of the feet.

So far as structure shows, the animal would appear to evert its lingual organ and apply it with a rasping action to the surface of the sponge, the successive pieces being crushed against the firm rugose wall behind by the hardened posterior surface of the tongue, and again subjected to the action of the deeply folded or lamellar region behind it. Thus, before the (especially soft tissues like those of sponges) food reaches the intestinal surface, it has been partially disintegrated and fitted for absorption. Minute shells of *Spirorbis* are of course less affected, though many are broken into fragments, and all are in a condition to give up their contents. Like the British *Euphrosyne foliosa* at Herm, the South African form would seem to browse on the patches of *Halichondria* and other sponges which abound under stones between tide-marks; and there is little wonder therefore that there should be so many interesting homologies between its buccal apparatus and that of such Nudibranchs as *Doris tuberculata* and *Doris johnstoni*, which follow precisely similar habits.

Euphrosyne borealis, Œrsted (Pl. I. figs. 2, 3; Pl. Ia. figs. 4–6).

Euphrosyna borealis, Œrsted, Grönl. Ann. Dorsibranch., p. 18, Tab. II. figs. 23–27.
Euphrosyne borealis, Auctorum.

Habitat.—A small example apparently referable to the foregoing occurred at Station 49 (off Halifax), May 20, 1873, lat. 43° 3′ N., long. 63° 39′ W.; depth, 85 fathoms; bottom temperature 35°·0, surface 40°·5; gravel and stones.

Observations.—The specimen agrees in external appearance with the Norwegian form —the smooth dorsal bristles projecting far beyond the branchiæ, and giving the back a very hirsute appearance. The serrated bifid dorsal bristles (Pl. Ia. fig. 4) are strongly marked; and it is to be observed that when viewed antero-posteriorly they are also bent laterally. The ventral bristles present rather an elongated tip beyond the spur, and the edge above the latter is often marked by a series of irregularly placed serrations—two varieties being shown in Pl. Ia. figs. 5, 6. Each of the processes at the tip has its internal canal. Some of the stronger bristles have the terminal portion less bent than

those represented; and all the characters are better marked in the large examples from Greenland. The latter very well bear out Œrsted's original remark—to the effect that the branchiæ are two or three lobed. In the present specimen, however, the organ next the dorsal median line is sometimes quadripartite. Œrsted also observes that there is no dorsal cirrus, but near the base of the latter branchial process is an organ which seems to be the homologue of the cirrus in the other forms, and which he had overlooked. This species is entered in the American fauna by Stimpson,[1] who states that it is not uncommon on muddy bottoms. It is not mentioned by Prof. Verrill in his dredgings on the coast of New England; and no example was obtained by Mr. Whiteaves in the Gulf of St. Lawrence, though the other forms procured at this Station closely resembled those from the latter region. In this form the nerve-cords seem to be placed farther inwards than in *Euphrosyne foliosa*, or than in *Euphrosyne capensis*. The layers of the body-wall—cuticular, hypodermic, and muscular—are largely developed. The proboscis has a well-marked chitinous layer (usually thrown into numerous wrinkles in the preparations) just within its external investment *in situ*. In his excellent brochure on the Annelids of Denmark,[2] Tauber includes this species, but he labours under a misunderstanding in comprising *Hipponoë jeffreysii* as a synonym.

Family Amphinomidæ.

Few representatives of this family were procured by the Challenger. In Grube's Annulata Œrstediana three are noticed. Sixteen are mentioned by Kinberg, but it is doubtful how many of these came from the voyage of the frigate "Eugenie." Four occur in Grube's list from the ship "Gazelle"; while five are included in Semper's Philippine series of the same author. Schmarda describes nine. The moderate number obtained by the Challenger probably depended on the prevalence of the common kinds amongst the shore rather than the deep-sea fauna, though the occurrence of others as surface-forms doubtless increased the list. They are chiefly southern, though the patient and successful labours of the elder Sars and those of his distinguished son have added two species to the northern fauna, viz., *Eurythoë borealis* and *Paramphinome pulchella*,[3] both ranging to the British shores. Moreover, both forms occur occasionally in deep water (about 600 fathoms) while extending to comparatively shallow water, or, in the case of *Eurythoë borealis*, to the tidal region. Those procured by the Challenger with one exception do not pass to a greater depth than 100 fathoms, several inhabiting the littoral region. The exception, however, is marked, for *Chloenea atlantica*, n. sp., descends to no less a depth than 1525 fathoms.

[1] Marine Invertebrata of Grand Manan, p. 36. [2] Annulata Danica, Kjobenhavn, 1879, p. 78.

[3] On söme Remarkable Forms of Animal Life, &c. i., 1872, p. 45. This species was probably first described by the author from specimens procured off Shetland by Dr. Gwyn Jeffreys, *vide Trans. Roy. Soc. Edin.*, vol. xxv. p. 406.

The members of the family have thus a varied distribution, ranging from the surface to the bottom, and from great depths to the littoral region. It has to be noted, however, that the species found at the surface have generally been on floating timber or other buoyant substances.

The *Chloeia* group is at present in a somewhat unsatisfactory state, even the number of eyes having been for a long time erroneously described; indeed it is only about twelve years ago that Kinberg and W. Baird made this correction. The head must thus have been superficially examined by Savigny, Lamarck, Audouin and M.-Edwards, Risso, Grube, Schmarda and De Quatrefages. Even in the work of the last-named author a form called *Aristenia conspersa*, Sav., is admitted amongst the Amphinomaceæ of uncertain seat. Now the figures in Savigny's plate (pl. ii. figs. 4'-4') clearly show that a *Trephonia* from the Red Sea has been represented, and that probably from bad keeping or otherwise certain changes had caused the artist to represent branchiæ. The actual structure of the dorsal and ventral bristles of the forms described up to the present date is shrouded in considerable obscurity, and though Kinberg's plates partly improve this condition, they also show that more yet remains to be done.

The bristles throughout the Amphinomaceæ have certain characters in common, viz., brittleness, calcareous composition, oleaginous contents often forming crystalline aggregations, and the well-marked tubular structure. In the Mediterranean *Chloeia* from the "Porcupine" the unusual form of a dorsal bristle with a simple tip (Pl. IIA. fig. 7) occurs, but it is interesting to observe that there is a distinct bend (on the right in the figure) a little below the serrations, and that in certain examples which have no evident serrations there is a rudimentary indication of the spur.

In regard to the structure of the bristles, again, the examples of the *Chloeia* group that have occurred in this collection and in the "Porcupine" range themselves under six heads. (1) The Mediterranean *Chloeia* from the "Porcupine," which has its dorsal bristles simple and serrate, and the ventral very slightly bifid. (2) Those from East Indian and Arafura Seas (*Chloeia flava*), in which the dorsal bristles are boldly serrated and bifid (small spur), and the ventral more distinctly bifid than the former. (3) *Chloeia fusca*, from the region near the Moluccas, which has bifid bristles of three kinds, viz., (*a*) very slender and attenuate, (*b*) with stout, short tips, and (*c*) with longer tips, serrated externally, while the ventral bristles are bifid and smooth. (4) In this and the two following a second dorsal or branchial cirrus is present, and the bifid dorsal bristles are of two kinds—(*a*) boldly bifid and smooth, and (*b*) bifid and serrated externally on the long limb. The ventral bristles are bifid and serrated internally on the long limb. The branchiæ are branched. It comes from the Atlantic (Canaries). (5) From the Bermudas. In this both dorsal and ventral bristles are bifid and serrated only on the inner side of the long limb, and the tips of both are short. (6) From the Philippine Islands. The dorsal bristles are very strong, with smooth bifid tips. The ventral are

similarly shaped, but with two serrations on the inner side of the long limb. The slight differences in the characters of the last mentioned series correspond with the close resemblances of the forms generally. *Lirione* agrees with the three last in having the branchial cirrus, but it is much shorter. There is only a single dorsal cirrus (in its usual position behind the bristle-tuft) in *Amphinome vagans* and in *Eurythoë pacifica*.

Chloeia, Savigny.

Chloeia flava (Pallas) (Pl. III. figs. 1 and 3; Pl. Ia. figs. 7–9).

Aphrodita flava, Pallas, Miscell. Zool., p. 97, pl. viii. figs. 7–11.
Chloeia flava, Auctorum.

Habitat.—Two examples were trawled at Station 233B (south of Japan), May 26th, 1875, in lat. 34° 18′ N., and long. 133° 35′ E., at a depth of 15 fathoms, amongst blue mud, the occurrence of *Synapta* in the same bottle bearing out the latter statement, though it would rather have been expected elsewhere. Surface temperature, 66°·3. The locality of the third specimen (a small one) is doubtfully marked "Arafura Sea."

The range of this form is great—from Cape Verde to Amboina, and generally throughout the Indian Ocean and Chinese waters.

Observations.—In his Miscellanea Zoologica, published in 1766, Pallas gives a very good account of the external characters of this form, one example of which Schlosser obtained for him from the shores of Bengal, whence it was fished up by the anchor of a Belgian trader, while the other came from Amboyna. Pallas gave it the name of *Aphrodita flava*, from the fancied resemblance of the colour of the bristles to the locks of Dione, the mother of Aphrodite (Venus). Gmelin then included it in his edition (1788) of Linnæus as *Terebella flava*.[1] Bruguières next mentioned the same form under the name of *Amphinome capillata*.[2] Risso[3] afterwards described a new form (*Chloeia rupestris*) from the Mediterranean, a fact which escaped the notice of some of his successors. Cuvier[4] then joined the two species as *Amphinome jaune ou chevelue*. Savigny,[5] again, established the genus *Chloeia*, in the fourth family of his Amphinomidæ, entering the same species as *Chloeia capillata*—the name given to it by his countryman being chosen rather than the rightful one of Pallas. This author and several others state that the eyes are only two; but there are really four, two on each side. Audouin and M.-Edwards[6] followed the latter, and pointed out the serrated condition of the dorsal bristles, and the bifurcated nature of the ventral bristles. They also only knew of the single form described by Pallas. Grube likewise gave *Chloeia* only two eyes;[7] and both

[1] *Loc. cit.*, p. 3114, No. 7.
[2] Encycl. méth., Dict. des vers, i. p. 45, No. 1, pl. lx. figs. 1–5.
[3] Hist. Nat. Eur. mérid., iv. p. 425.
[4] Dict. d. Sci. Nat., t. ii. p. 71; and Règne Anim., t. ii. p. 527, edit. 3, pl. ix.
[5] Syst. des Annél. p. 58.
[6] Hist. Nat. des Annel., p. 120.
[7] Fam. der Anneliden, pp. 40 and 121.

he and Blainville[1] term the species *Chloeia flava*. Kinberg[2] separates the *Chloeia flava* of De Quatrefages as *Thesmia flava*, since it differs in the structure of the bristles; and the remarks by Dr. Baird[3] on the latter author's species are important. Thus I agree with him in considering that *Chloeia incerta*, De Quatrefages, cannot be separated from *Chloeia flava*, and that probably an error has crept into his description of the dorsal bristles of the latter. The observation of De Quatrefages that *Chloeia furcigera* is distinguished by having bifid bristles in both dorsal and ventral series only shows that the true nature of these organs in the group was misunderstood, since all are morphologically bifid. Finally, Prof. Grube describes the occurrence of the present form from Amboina, Salavatti, and Cape Verde, in the collection made by the German frigate "Gazelle," as well as in that made in the Philippines by Prof. Semper. The same author points out[4] that his *Chloeia ceylonica*[5] is only a young form of *Chloeia flava*; while the *Chloeia pulchella* of Dr. Baird in the British Museum seems to be the same species. It was procured by H.M.S. "Herald" from Raine Islet, North Australia. *Chloeia flava* appears, on the whole, to be an eastern type.

The larger of the two Japanese examples is less than 3 inches, and therefore does not come up to the original specimen procured by Pallas; and this difference in size would appear to correspond with the diminution in the number of segments. Pallas mentions forty segments, whereas M. de Quatrefages says from thirty-five to thirty-seven. In the present case the segments numbered respectively thirty-five and thirty-eight.

The body is somewhat fusiform in outline, but the addition of the bristles gives it an ovoid appearance. The head is small, and dorsally almost wholly occupied by the tentacles and caruncle. Anteriorly are four tentacles, the inferior pair being pale in the preparation, widely separated at the base, and considerably shorter than the superior. The latter (which alone are mentioned by Pallas) arise close together in front of the caruncle, and are pale ventrally, but tinted of a rich madder-brown dorsally. Behind them is the large rugose caruncle, which consists of an elevated, doubly crenate crest and a wrinkled horizontal portion; moreover, the middle of the crest is marked by an interrupted brown line. The organ, fixed to the first two segments, extends to the commencement of the fourth, and terminates in a free tapering extremity. Attached in a groove at the anterior end of the caruncle is the long brown median tentacle, which is about twice as long as the pair in front of it: like the rest it is a simple subulate process. In a line with the anterior margin of the latter, or in the smaller form decidedly in front, is a large pigment-speck, and behind it a smaller, on each side, so that, as mentioned in the Mediterranean *Chloeia*,[6] four is the correct number of eyes, and not two, as mentioned by Savigny and many of his successors. Kinberg[7] noticed the error,

[1] Dict. d. Sci. Nat., art. "Vers."
[2] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1867, p. 86.
[3] *Journ. Linn. Soc. Lond.* (Zool.), vol. x. p. 230.
[4] Annel. Fauna d. Philippinen, p. 10.
[5] *Proc. Zool. Soc. Lond.*, 1874, p. 326.
[6] *Trans. Zool. Soc. Lond.*, vol. ix. p. 396.
[7] Freg. Eugen. Resa, pl. xi. fig. 1.

and rightly gave his figure four eyes; and Dr. Baird[1] likewise observed the true condition in several species.

When closed, the mouth presents a simple puckered orifice with two prominent fleshy lobes running to the anterior border of the head, and which are probably the homologues of the same parts in *Euphrosyne*. They are not merged into the gape during the extrusion of the proboscis, but form two sides of a special triangular fold superiorly. The posterior border of the mouth occurs at the margin of the fourth segment. The extruded proboscis probably agrees with that of the Mediterranean form in being in three tiers, viz., a membranous basal portion, a denser median, and a firm cartilaginous distal part in the form of two lateral lips.

Each of the typical segments of the body bears a branchial tuft, a well-marked dorsal papilla with a fascicle of bristles, and immediately behind a long madder-brown cirrus upon a pale basal portion, while the ventral division has a very long tuft of bristles, and a shorter pale cirrus placed inferiorly and posteriorly. The first three body-segments possess no branchial tuft, but, as mentioned by Pallas, have a second small pale cirrus at the base of the dorsal one.

The dorsal bristles spring in a radiating fan-like manner from the papilla, and consist of long tapering organs with yellow tips and a secondary spur at the base (Pl. Ia. fig. 7, which represents one from the middle of the dorsum). The distal end is pointed—smooth on the side with the basal spur (absent in Dr. Baird's *Chloeia tumida* from India), but on the opposite edge furnished with from twelve to twenty large recurved fangs, besides having the tip beyond the latter slightly serrated. Kinberg's artist does not clearly define the spur.[2] In the preparations the yellow pigment is most intense just above the latter, and this colour is very characteristic in glancing at the bristles *en masse* in spirit-preparations, especially when contrasted with *Notopygos* and allied forms. These bristles have a slight curve, and terminate inferiorly in a slender and almost pointed extremity, so that they are fusiform. The anterior dorsal bristles differ in having in some cases smooth tips and a longer basal spur (Pl. Ia. fig. 8), while in others there are very few recurved fangs. The mere number of the latter is therefore immaterial. The bristle-papilla to which the dorsal fascicle is attached is peculiar in rising out of a kind of pit in the adjoining skin, which forms a free margin all round, with the exception of the posterior third. The whole tuft can thus be readily moved.

The ventral bristles consist of long yellowish structures having tips like that represented in Pl. Ia. fig. 9. They terminate inferiorly in long tapering roots, which appear to be solid for a considerable distance. There is little difference between the anterior and posterior forms, except that the former are more slender. It will thus be apparent that all the bristles of this form are modifications of a single type.

The dorsal cirrus is a simple subulate process springing from the bristle-papilla

[1] *Journ. Linn. Soc. Lond.*, vol. x. p. 230.

[2] *Op. cit.*, pl. xi. fig. 1, G.

towards its posterior border and having a basal segment and an elongated terminal region, which is purplish-brown throughout, whereas the former region is less deeply coloured, with a pale band in front. From the base of the process a fan-shaped patch of pigment extends downward and inward on the bristle-papilla. The ventral cirrus is quite pale, and lies below and rather behind the ventral tuft of bristles. A slight enlargement of the base occurs anteriorly. The cirrus is filiform, tapering, and considerably shorter than the dorsal.

About thirty-two pairs of arborescent branchiæ are ranged along the dorsum, the number varying according to the length of the specimen. Each is situated at the posterior border of the segment, a short distance from the cirrus, and slightly overlapped by the reflecting dorsal bristles. Their shape is dendritic: a central stem rising from the dorsum and giving off, first, a large external branch, which generally divides into two, and these give off others, which bear the ultimate pinnules. The other branches of the main stem pass off transversely (nearly opposite in arrangement) and subdivide into pinnules. Those at the tip are simple, *i.e.*, have no subdivisions. In the ordinary condition the branchiæ fold backward, and since the pinnules are all grouped posteriorly they are thus in the most protected position. In minute structure the stem consists externally of a firm cuticular investment, a considerable layer of hypoderm, a central area of muscular and connective tissue, and the two main vessels (afferent and efferent). Each of the ultimate pinnules also carries its two blood-vessels in the midst of a considerable amount of hypoderm. The muscular fibres in the centre of the main stem are complex—longitudinal and radiating as well as transverse. If a longitudinal section of any of the larger branches be made, the tranverse fibres form a series of septa.

The branchiæ continue to the penultimate segment, but diminish in size posteriorly. They are marked by a deposit of pigment, best seen in small specimens, along the main branches.

The dorsum of the animal has a very conspicuous row of brownish-purple spots, which occupy the posterior two-thirds of each segment, in the middle line. A brownish band also occurs at the anterior part of each segment, from the branchiæ outward. The anus is dorsal, with two elongated cirri behind it.

When withdrawn the proboscidian region presents three layers—an outer membranous, a denser middle portion, and an inner division of cartilaginous consistence. The latter forms two longitudinal folds, which in extrusion become transverse. In the quiescent state of the parts (*i.e.*, when withdrawn) in the Mediterranean *Chloeia* procured during the "Porcupine" Expedition, the lining tissue of the buccal cavity forms some simple folds superiorly, above the two muscular external lips. These folds gradually increase in complexity, and when the lips disappear they form a series of vertical and horizontal papillæ. The latter are covered by the usual dense cuticle, with hypoderm beneath, and followed by a complex muscular layer varying according to the situation examined.

Immediately behind the mouth-slit a continuous ring of the following structure is formed by the buccal wall :—Superiorly are various leaf-like glandular papillæ, succeeded on each side by an inferior dense margin composed of the two muscular processes which become terminal in extrusion. A variously folded papillose region occurs beneath and completes the ring. The chief muscles are massed at the sides of the dense superior folds. The great ridges increase in size and muscularity as we proceed backward, and the wall beneath becomes more compact. The muscular fibres moving the dense lips are evidently important, and are probably the chief agents in the biting movements which the part performs in alimentation. The fibres form a complex transverse and longitudinal meshwork, the free surface of the part having a glandular structure. Passing inwards, another fold then occurs externally on each side, and the superior papillæ occupy a larger space, while the region next them has its surface covered with pointed papillæ, and the dense portion is confined to the ventral part of the massive plait. The wall of the buccal organ presents the following minute structure :—Below the dorsal thin glandular portion the massive lateral wall is formed by an interwoven series of transverse and longitudinal fibres, the conical papillæ being on the inner surface. Beneath is a dense fold of the hard pad, which in section has the inner part of its area filled with longitudinal fibres. The secondary fold below is now made up of interwoven longitudinal and oblique fibres, and this and the former plait are bound to the dense outer wall of the organ by strong muscular bands. Instead, therefore, of forming the upper part of the lateral wall, the dense portion now constitutes the lower, the two accessory folds (enveloped in a firm layer) meeting in the middle line beneath, while the papillæ have disappeared from the wall outside them. Immediately behind, the fold on each side unites with its fellow, the larger superior mass being formed chiefly of longitudinal fibres within the glandular layer, and the inferior of a complex interlacement of longitudinal and transverse fibres, the latter forming spaces for the former. The upper lateral wall is boldly papillose, while the dorsal margin has a row of blunt papillæ. The lower part of the organ gradually merges into the upper, with similar radiating and circular fibres, the whole (with the exception of the dorsal arc) forming a dense muscular tube. Beneath is a great retractor of longitudinal and vertical fibres. Internally the long papillæ of the lateral surface are continued over the ventral curve. The outer wall of the rounded tube is composed of a well-marked series of longitudinal fibres, which gradually increase in thickness from the dorsal to the ventral median line. The papillæ on the inner surface then have a tendency to form ridges, and the thin glandular wall is greatly extended dorsally; while the canal diminishes in calibre, assuming a uniform outline, the inner surface being covered with the glandular rugæ and papillæ resting on a coat of circular muscular fibres—externally bounded by the longitudinal layer.

The whole muscular mechanism of the organ is suited for performing the functions of a pair of fleshy biting pads, for the extrusion and retraction of these in varying degrees,

and probably also for their employment as crushing surfaces in the passage of the food inwards in the ordinary state of the parts. The arrangement of the fibres in the thickened retractor would further assist in the expulsion of the organ, as in *Maupelona*.

In extrusion the basal or membranous portion of the organ is formed by a plait continuous with the lips, which passes inward to the posterior retractor muscles, so as to join the denser inner fold of the proboscis; the middle region is formed by the latter, and the distal by the denser yellowish part, the two divisions of which, by the nature of their connections, are directed vertically in the extruded condition.

The food of this species probably consists of the same nature as that of *Euphrosyne*. The cardiac opening of the stomach, in the retracted condition of the proboscis, projects into the organ on a similar long rugose eminence. The inner surface of the stomach is remarkably ridged and glandular, while in transverse section the intestine presents a closely arranged series of glandular lamellæ.

In vertical section the caruncle is found to be composed chiefly of hypodermic tissue enveloped in cuticle. In the centre a strong vertical muscular band proceeds from the body-wall to the crest, and numerous longitudinal fibres appear at the base (in the peduncle). In front a deep indentation exists on each side a little above the base, surmounted by numerous narrow folds. The latter occur from base to summit posteriorly, and have the aspect of a single series of zig-zag folds on each side. The madder-brown pigment is deeply imbedded, and close to the central vertical muscular septum. In front a series of fibres proceed from the latter along the median tentacle, and similar bands occur in the other cirri. The anterior part of the caruncle lies over the cephalic ganglion, but the function of the organ is doubtful.

In regard to the structure of the body-wall, the cuticle is comparatively dense, the hypoderm somewhat less developed, while the circular, longitudinal, and other muscles are strong. The nerve-cords are somewhat small and flattened, being placed in an area bounded internally by a transverse band of fibres, and externally by the circular muscular layer and hypoderm. The oblique muscles are attached at the outer border of each trunk.

Dr. Baird's *Chloeia tumida* seems to be rather like this form, but devoid of spots on the dorsum. One collected by H.M.S. "Alert" off Torres Straits Islands had taken a hook, which is now firmly grasped by the proboscis of the blackened preparation.

A small specimen measuring about an inch in length is marked with doubt as a native of the Arafura Sea. The segments amount to about thirty, exclusive of head and tail. The bristles agree in structure with the foregoing, allowing for the difference in size. The branchiæ are less branched, a condition probably due to the latter. The coloration and other features correspond.

Chloeia fusca, n. sp. (Pl. II. figs. 1 and 2; Pl. Ia. figs. 14, 15; Pl. IIa. figs. 1, 2).

Habitat.—Dredged near Banda (a Station off the Moluccas), 1st October 1874.

The entire body of this species is iridescent dusky brown, with a well-marked pale median dorsal stripe from the caruncle to the tail. This pale band is rendered very distinct by a darker brown belt on each side, so that there are really three stripes on the dorsum. The body is about 18 mm. long, and consists of twenty-three segments. The latter are broader from before backwards than in *Chloeia flava*, and on the whole are more evidently marked.

The head is well-defined, and bears posteriorly a caruncle, which extends to the fifth body-segment. The folds of the organ are more lax than in *Chloeia flava;* indeed they form a series of distinct vertical lamellæ, which are easily separated externally down to the ventral fold. The four eyes are distinct, two being at the anterior border and two toward the posterior border of the head in front of the caruncle. At the anterior end of the latter is a very long tentacle, which exceeds the caruncle in length. Like the caruncle it is pale buff in the preparation, without any special development of pigment. Two shorter tentacular cirri spring from the anterior border of the head; and the inferior cirri at the sides of the labial folds are pale, short, and slender. The labial folds are large and prominent, and the mouth opens immediately behind, *i.e.*, at the anterior border of the third body-segment, which has two curved rugæ in the middle line.

The branchiæ commence on the fifth body-segment, and continue to the tail, about seventeen being visible; while the first four feet, on the other hand, have a second (smaller) dorsal cirrus, placed to the inner side of the bristle-tuft. In the preparation the organs are directed backward, with the pinnæ placed outward and backward, so that the main stem is internal, a feature less prominent in *Chloeia flava*. There are generally five branches on each side of the main stem, each furnished with secondary pinnæ, the basal branch on the outer side being larger than the rest. Their colour throughout is slightly ferruginous.

Most of the bristles had been swept from the dorsal tufts, only the anterior and posterior segments having escaped. The bristles on the whole are more opalescent than in *Chloeia flava*, though a tinge of the same characteristic greenish-yellow occurs in all. As, however, many of the best marked and most typical bristles are absent, the following remarks will probably require qualification when a complete example is obtained. Three types are apparent in the dorsal tuft; first, a very slender elongate kind, which diminishes from the lower third to a little below the fork (Pl. Ia. fig. 14), the slender tip extending far beyond the point figured; and one tinted of a deep yellow throughout this region, the long limb of the fork being extremely produced, and, like all the other tips of the dorsal bristles, minutely granular from microscopic projections. The next kind (Pl. IIa. fig. 1) has either a deep yellow tip and pale shaft, or is more elongated, with a pale attenuated

tip beyond the fork, and very conspicuous grains toward the end of the longer limb. The third type (Pl. IIA. fig. 2) has the usual serrations on the edge of the long limb, and each is tinted deep yellow from a little below the dilatation of the fork to the tip. The figure represents an intermediate form, some being longer, and with more distinctly-marked serrations.

The ventral bristles in structure resemble Pl. IIA. fig. 1, some having the tips deep yellow, others being pale or very slightly tinted. As a rule the long limb of the fork is somewhat more slender than in the case of the dorsal, and posteriorly this feature is much more developed. The granular (shagreen) aspect of the tips is also present in the ventral bristles, an average example of which is shown in Pl. IA. fig. 15, from one of the anterior feet.

The dorsal cirri spring from the usual position at the posterior border of the dorsal bristle-papillæ, and are slender, the tip being very finely and gradually attenuated. The base and tip are somewhat pale, the rest deep purplish-brown. The ventral cirrus tapers from base to apex, is pale and much shorter than the dorsal. The caudal styles are absent. A little granular matter and sand only were present in the stomach, and it is curious that both this and the previous species should have the intestinal tract so empty.

Observations.—Kinberg[1] mentions two species from the east besides *Chloeia flava*, viz., *Chloeia bengalensis* and *Chloeia malaica*, but as no description or figure is given, it is impossible to identify them. Accordingly it has been deemed prudent to give the present form a new name. It will readily be distinguished when descriptions of the two first-mentioned are published. The *Chloeia parva* of Dr. Baird resembles this form in the outline of the body, but differs in other respects. Its locality is unknown. The *Chloeia macleayi* of Mr. Haswell, from Australia, differs in the structure of the bristles (so far as description goes) and in coloration. Prof. Grube's *Chloeia ceylonica* likewise appears to have a dark body.

Chloenea, Kinberg.

Chloenea atlantica, n. sp. (Pl. I. fig. 4; Pl. IA. figs. 10–13).

Habitat.—Dredged at Station 3 (south of the Canaries) 18th February 1873, lat. 25° 45′ N., long. 20° 14′ W., in a depth of 1525 fathoms; bottom temperature 37°·0, surface 68°·0; hard ground. Two specimens were found adhering to the remarkable sponge *Poliopogon amadou*, Wyv. Thoms., which grew upon the calcareous axis of a dead *Corallium*, coated with peroxide of manganese.

The body (measuring 12 mm. in length and 5 mm. in breadth) is short and somewhat ovoid, wide at its anterior third but tapering posteriorly, and composed of about

[1] *Op. cit.*, p. 86.

nineteen segments. The opalescent bristles (milk-white in life) project nearly as much on each side as the breadth of the body. Posteriorly it terminates in two elongated styles. The head bears a large and somewhat spongy, rugose caruncle, which extends backward at least to the fourth segment. The folds almost separate from each other on manipulation, and their looseness affords a distinctive feature when contrasted with those of *Chloeia flava* and others. No eyes are visible in the specimens. In front of the caruncle is the median tentacle, which has about the same proportional length as in *Chloeia*. It is tinted of a dark greenish hue superiorly. After a longer interval than in *Chloeia* a pair of tentacular cirri, also slightly tinted superiorly, occur at the anterior border of the snout. The other pair (similarly coloured) are situated at the sides of the anterior labial processes. The latter are well developed, and homologous with those in *Chloeia*. The posterior border of the mouth is formed by the second body-segment instead of the fourth as in *Chloeia*. The segments of the body have a comparatively large antero-posterior diameter, the median five or six being conspicuous in this respect. A typical segment bears on each side of the middle line a dorsal branchia, a tuft of long opalescent bristles, two dorsal cirri, a ventral tuft of long bristles, and a ventral cirrus.

The branchiæ seem to commence on the fifth segment, and when fully developed consist of a short trunk bearing three or four simple pinnæ, and an external basal division of a few processes. These organs are softer than in *Chloeia flava*, and their hypodermic tissue is less compact. A series of muscular fibres runs from base to apex along the main stem, and in the pinnæ fibres occur within the hypoderm at each side in ordinary views.

The dorsal bristles are opalescent and elongated, especially posteriorly, so that the body of the animal is enveloped in a kind of *chevaux defrise* by the crossing of the bristles anteriorly and posteriorly. Each bristle may be described as a long fusiform structure, the base equally with the tip tapering to a fine point. The shaft gradually dilates upward, then diminishes somewhat below the fork, where a little enlargement occurs. The elongated limb beyond the bifurcation has a slight bend opposite the tip of the shorter, and in the best developed a series of serrations occurs on the outer border of the long limb (Pl. Ia. fig. 10), the points being directed downward in the ordinary way. Others show a slighter array of serratures along the edge next the fork (Pl. Ia. fig. 11), while a third and somewhat shorter set (Pl. Ia. fig. 12) appear to be quite smooth. These bristles have a very thin external crust, and are somewhat less brittle than in *Chloeia flava*. The air alluded to by Claparède probably gained entrance into the bristles of the latter through cracks. The anterior dorsal bristles have stouter though shorter tips, with all the markings boldly developed, especially the serrations on the side next the fork. The point of insertion is much more slender than the distal end. Those towards the extremity of the tail, again, are characterised by very elongated tips and distinctly serrated outer margins, as in Pl. Ia. fig. 10.

The ventral bristles form long asbestos-like tufts, which make a remarkable fringe,

especially in the posterior half of the animal. About the middle of the body the structure of the tip of each bristle resembles that in Pl. Ia. fig. 13. The long limb beyond the fork has serratures like those seen in the corresponding region of the dorsal bristles, and the shaft is extremely long, nearly cylindrical for the greater part of its length, and terminates inferiorly in a pointed extremity, as formerly indicated in the dorsal bristles. Moreover, the same shortening of the tips anteriorly and the elongation posteriorly characterise the ventral bristles. In the posterior bristles the longer limb of the fork is in many slightly curved inward at the tip.

At the inner margin of the dorsal bristle-tuft, and a little in front and to the exterior of the branchia is situated a long filiform cirrus, which is tinted brownish-green superiorly, such forming a distinction, therefore, between this form and *Chloeia*. Another cirrus, the homologue of that in *Chloeia*, springs from the posterior part of the dorsal bristle-papilla, and like the former is extremely long and attenuated, with the pigment placed distally. The ventral cirrus occurs in its usual position, viz., rather below and behind the ventral bristle-tuft. It is also furnished with pigment distally.

When dredged up, it was referred (*vide* Atlantic, vol. i. p. 176) by Dr. v. Willemoes Suhm to the family Amphinomidæ, sub-family Euphrosyninæ, with many of the characters of the genus *Euphrosyne*. It approaches Grube's genus *Notopygos* in general configuration, and in the presence of the branchial cirrus, but differs materially in regard to the structure of the branchiæ and the nature of the bristles, both of which show a nearer approach to *Chloeia*. In the present unsatisfactory condition of the *Chloeia* group, and though Kinberg's description of the genus can hardly be followed, I have thought it best not to make a new genus, but to place it under his *Chloenea*.[1] In the structure of the body-wall and the arrangement of the nerves it agrees with *Chloeia*. The perivisceral corpuscles are largely developed, and the wall of the stomach is loaded with refracting cells and granules, the contrast between this region and the more rigid intestinal canal with its lobose and more translucent glandular papillæ being well marked.

Notopygos, Grube.

Notopygos megalops, n. sp. (? *crinitus*, Grube, var.) (Pl. I. fig. 1; Pl. IIa. figs. 3, 4).

Habitat.—Dredged at Station 36 (off the Bermudas) April 22, 1873, in 30 fathoms, amongst coral.

The body is about 9 mm. in length and 3 mm. in breadth, is fringed by a dense series of pellucid bristles, and consists of about nineteen segments besides head and tail. The segments are distinctly marked, those in the middle of the body having the greatest antero-posterior diameter, as in the previous form.

[1] *Op. cit.*, p. 86.

2

The head bears a caruncle which extends backward to the fifth body-segment, and has the usual folded structure, a little more lax than in *Chloeia*. At its anterior border is a short, slender, filiform tentacle, and the two pairs of tentacular cirri (one in front of the head and the other beneath) are also very small and short. All these organs are quite pale in the preparation. A pair of very large black eyes lie immediately behind the tentacular cirri at the front of the head, and a smaller pair behind them, a little anterior to the base of the tentacle. In front of the mouth are the fleshy lips, which extend to the anterior border of the third body-segment.

The branchiæ commence on the first segment clear of the caruncle (sixth), and continue apparently to the last. When fully developed each consists of a small tuft of about four branches, viz., a lateral on each side, and a median, which becomes bifid shortly after its commencement; and occasionally a third small process proceeds from the larger division of the latter. These organs are highly vascular, a large afferent and efferent vessel passing along each process.

The dorsal fascicle, projecting from the usual papilla, consists of a series of stiff glassy bristles, which at the anterior third of the body present a boldly forked tip, with a smooth outer margin, and having about three serrations on the inner surface of the longer process, near the tip (Pl. IIA. fig. 3), thus differing from the *Notopygos flavus* of Haswell.[1] The central canal is very distinctly marked, both in the shaft and the processes beyond the fork. After remaining for some hours on the slide in distilled water, a peculiar exudation (of an oleaginous appearance) took place from the fractured bristles, the majority of the isolated drops having a pyriform aspect with a pointed end; and sometimes they formed a concentrically arranged group like certain fatty crystals.

The ventral bristles form a similar stiff glassy fringe. An average example is shown in Pl. IIA. fig. 4, the form being more slender than in the dorsal series, but the curves at the fork similar. The serrations along the inner margin of the long limb are, however, much more distinctly marked than in the dorsal bristles, about four being present in each. The type of bristle, therefore, is identical in both dorsal and ventral groups.

A slender filiform dorsal cirrus exists in front of the branchial tuft, and anteriorly it occupies a similar position though the latter is absent. A cirrus with a stout buff-coloured basal division arises from the usual situation behind the dorsal papilla. The tip is pale, filiform, and long. The ventral cirrus is pale, subulate, and comparatively short.

In this form the nerve-cords lie within the circular coat, the hypodermic insertions of the oblique being at their external border. The proboscis has internally numerous ridges composed of hypoderm with a chitinous covering, while a well-marked circular muscular layer encircles their bases in section.

This species has certain resemblances to Grube's *Notopygos crinitus*,[2] from the neighbourhood of St. Helena, but the structure of the bristles as shown by Kinberg differs,

[1] *Proc. Linn. Soc. N. S. Wales*, 1878, p. 343.

[2] *Archiv f. Naturgesch.*, Jahrg. xli., 1853, p. 93.

since the ventral bristles in the form procured by the Challenger are serrated like the dorsal. The size of the eyes also diverges. Further investigation is therefore necessary

Notopygos labiatus, n. sp. (Pl. II. fig. 6; Pl. IV. fig. 2; Pl. IIA. figs. 5, 6).

Habitat.—Trawled at Station 201 (in Basilan Strait, to the south of the Philippine Islands), in lat. 7° 3′ N., and long. 121° 48′ E., in a depth varying from 84 to 102 fathoms; surface temperature, 83°·0; bottom—stones and gravel.

It was accompanied by *Polynoë*, *Eunice*, *Serpula*, and a small Holothurian with long ambulacral processes. As further evidence of the hard nature of the ground is the occurrence amongst the bristles of fragments of tubes formed solely of sponge-spicules, ranged round the wall in a transverse manner or reticulated together to form the branched end of the tube (*Terebella?*). There were also in the same shelter a few fragments of gravel.

This is a comparatively large form, measuring about 30 mm. in length by 9 mm. in breadth, and having the sides and dorsum protected by a dense series of stiff bristles, which are pale green throughout. The body has the usual shape, and consists of from twenty-five to twenty-eight well-marked segments. On the dorsum a triangular brownish area indicates the middle line at each segment-junction. The ventral surface is marked by a median line. The head is furnished with a caruncle which extends to the posterior part of the fifth body-segment. It is of a deep blackish hue below the inferior frills. The lamellæ are somewhat lax and spongy, but symmetrically arranged; the lower being very regularly folded and more rigid. The front of the organ is bounded by a median and two lateral folds, while posteriorly the pointed tip is formed by a coalescence of the transverse plaits. Close to the front of the caruncle is the comparatively short median tentacle, while after an interval in front of the head are the two superior tentacular cirri, which resemble the former in shape. The inferior are placed on each side of the prominent lips. The rounded head lies in front of the caruncle, and has a large eye on each side anteriorly, and a smaller, separated by a considerable interval, behind. The great oral folds or lips project in front of the head when viewed from the dorsum. The hinder part of the mouth is formed by the third body-segment. Posteriorly the body terminates in two thick club-shaped processes.

The branchiæ in contraction form small tufts composed of two divisions, viz., a small outer and a larger inner. The outer bears a series of pinnæ, with occasionally secondary pinnæ, while the inner, in the form of a miniature bush, likewise shows minor branches. All have specks of pigment, so that they are slightly greenish in spirit. In their ordinary position in the preparation the main stem is external, the pinnæ being directed inward toward the middle line.

The pale greenish dorsal bristles are very prominent, and are large, stiff, and fragile.

As usual they increase in length from before backward. Their chief peculiarities are the large size, smoothness, and the great length of the median peninsula before the canals from the processes join (Pl. IIA. fig. 5).

A slightly opaque granular deposit exists outside the canal in the longer process, and often also in the smaller, as well as in other parts of the tip. The canals show very distinct granules below the fork. The whole of the tip, to a point below the fork, is covered with a microscopic shagreen. The arrangement of these dorsal bristles is always more lax than that of the ventral.

The ventral bristles form a dense fascicle with the broad axis of the fan directed vertically. The larger bristles are generally dorsal, indeed, when the tuft is viewed from the ventral aspect a somewhat regular gradation of the tips is observed, so that the slope from below upward is bristled with a continuous series, which the few shorter dorsal bristles do not affect. In a lateral view the outline narrows from below upward to the long bristles. These are paler than the dorsal, and much more slender (Pl. IIA. fig. 6). The inner border of the long process of the fork has two (or in some three) serrations, and the isthmus at the base of the fork is proportionally shorter than in the dorsal. The type of both corresponds very closely except that the surface of the tip in the ventral does not show the microscopic shagreen. When a bristle is broken and left in water the shaft exhibits in its centre a series of obliquely curved lines, and in many a number of regular transverse lines occur below the isthmus at the fork, and throughout a considerable extent of the shaft beneath. The yellowish oleaginous contents of the bristles are well seen after fracture, both externally and in the hollow of the shaft, where they sometimes assume a lenticular shape. Mr. W. A. Haswell, B.Sc., who has so carefully and skilfully investigated many of the Annelids of New South Wales, describes two species of *Notopygos*[1] in which both dorsal and ventral bristles are quite smooth. The dorsal bristles of the present species, *Notopygos labiatus*, have no serrations, so that too much weight need not be attached to this character of Kinberg's.

The branchial cirrus arises at the inner border of the bristle-papilla, a little in front of the branchia, is pale at the base, but tinted madder-brown throughout the rest of its extent. It is covered with rows of long cilia. The dorsal cirrus proper (in the usual position behind the papilla) has a madder-brown large basal division and a filiform pale distal region, which is constricted just below the somewhat cylindrical tip.

In transverse section the body-wall shows the features of the group, besides certain definite characters of its own. Instead of the little bifid papillæ of the hypoderm of the central dorsal region of the *Chloeia* from the Mediterranean, this form shows a central and two median longitudinal ridges, by the great increase of the central oblique muscles of the part. The circular muscular layer (beneath the hypoderm) is also largely developed. The nerve-cords are especially large and distinct, and are much less flattened out than in

[1] *Proc. Linn. Soc. N. S. Wales*, November 25, 1878.

Chloeia; but the attachment of the oblique muscles at the sides, and the relation to the other parts are the same. The circular muscular coat of the intestine is also strongly developed. It is noteworthy that this and the previous kinds so often have empty intestinal tracts. As in many fishes, the digestive process is probably rapid. In vertical longitudinal section the posterior part of the great muscular cushion or tongue presents an easily separable series of the usual vertical muscular lamellæ, transversely arranged. They possess a somewhat fan-shaped appearance.

This form differs from Grube's *Notopygos crinitus* in regard to the branchiæ and the structure of the bristles as shown by Kinberg.[1] There is considerable doubt in regard to its connection with *Notopygos maculata*, Kinberg,[2] from the island of Panama, which Semper also found at Bohol in the Philippines;[3] but in the characters above-mentioned it also deviates from this species. A re-examination of the bristles of *Notopygos maculata* would help to remove ambiguity.

Amphinome, Bruguière.

Amphinome rostrata (Pallas) (Pl. I. fig. 7; Pl. IV. fig. 1; Pl. Ia. fig. 16; Pl. IIa. figs. 8–12).

Aphrodita rostrata, Pallas, Misc. Zool., p. 106, Tab. viii. f. 14–18, 1766.
Amphinome rostrata, Auctorum.

Habitat.—Several fine examples were procured at the surface of the sea near the Bermudas, some being captured along with a large *Hermodice* on a log. *Amphinome vagans* is occasionally found under the same circumstances on floating timber.

All the specimens are distinguishable by very evident external characters in spirit, viz., the peculiar slate-blue of the entire body, and the ferruginous hue of the tentacles, cirri, and branchiæ. The smaller specimens have the bluish colour of the body less marked, especially ventrally. A small example of *Amphinome vagans*, Leach (Sav.), procured from the Godeffroy Collection, and named by Grube, shows this colour on the dorsum, while the ventral surface is pale buff; and the latter colour characterises another all over.

Since the description by Pallas, no author has entered minutely into the characters of the animal, and therefore it is necessary to do so on the present occasion, as at least one species (*Amphinome vagans*) is closely allied.

The body is elongated and somewhat tetragonal, the following numbers of body-segments occurring respectively in the examples:—56, 56, 50 (imperfect), 52 (imperfect), 46 (small), 48 (imperfect), 50 (imperfect), 49, 51, 54, 52, 58, 59, 57, 51. Pallas gives 66 as the total number in his small specimen, 55 in the larger. Segments are so readily thrown

[1] Freg. Eugen. Resa, Tab. xi. fig. 3, G.
[2] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1857, p. 12; and Freg. Eugen. Resa, Taf. xi. fig. 5 (as *Lirione maculata*).
[3] Annel. Fauna d. Philippinen., p. 8, Taf. i. fig. 3.

off in such an animal, and the anal region accommodates itself with such ease to the altered circumstances, that little weight is to be put on this feature. Both dorsal and ventral surfaces are somewhat convex, the former being marked transversely with the segment-lines and slightly corrugated throughout; the latter showing the segment-junctions even more distinctly, each being coarsely rugose, and having a median longitudinal furrow. The three segments behind the mouth are somewhat smoother.

For so large a body the head seems disproportionately small. In front the snout, which consists of the anterior border of the buccal segment and corresponds to the prominent anterior labial folds in *Euphrosyne* and *Chloeia*, bears two tentacular cirri (palpi) which are larger than the succeeding processes of the kind. They are conical and of a ferruginous hue from base to apex. The next organs are the two cirri situated at the anterior border of the slightly differentiated cephalic region, which indeed appears at this part to be continuous with their buccal division. Their bases are separated by a slight interval, and each has a basal bluish segment, and a terminal conical ferruginous division. Immediately behind is the small tongue-shaped caruncle, which springs nearly in a line with the anterior border of the first bristle-papilla, and terminates in a groove in front of the posterior border of the first body-segment. The organ is attached along the middle throughout its entire length, but is free at the edges. Its upper surface is quite smooth, or in some slightly wrinkled, and the whole is somewhat darker (bluish-black) than the surrounding parts. In some the edges are of the latter shade, while the central region is of the ordinary bluish colour of the dorsum. It is deeply cordate in front, and at the termination of the sinus bears a short ferruginous conical process—the median tentacle. The mouth opens inferiorly at the anterior border of the third body-segment, and from the oral aperture two well-marked folds (corresponding with special thickenings in *Chloeia*) run forward to the anterior prominence of the snout which bears the cirri. These folds are wide in front, narrow behind. Two additional plaits pertain to the second segment, and another to the first.

The branchiæ commence on the third body-segment, and have the form of dense arbuscles, the first being nearly as large as any of the succeeding. So dense are they, indeed, that Pallas likened them to the cotyledons of the ruminant chorion. Each arbuscle consists of six or seven main stems springing from a common base, and dividing somewhat dichotomously into a dense bush of filaments. The outer stems have shorter terminal processes, the inner possess both longer stems and longer terminal processes. The latter are ferruginous in colour throughout, while the stems and branches are of the usual bluish tint. The tuft is situated close to the base of the dorsal bristle-papilla, and somewhat to the inner or dorsal side. The larger (dorsal) branches of the arbuscle envelop the bristle-papilla in the preparation, so that only a small portion of its anterior and inferior region is bare. The branchiæ are continued to the tip of the tail. Towards the posterior fourth of the body, as Pallas says, they meet on the dorsum, again separat-

ing toward the anal region. Pallas also correctly observed that the branchiæ do not proportionately decrease posteriorly.

The dorsal cirrus arises from the posterior part of the dorsal bristle-papilla, and has a basal and a distal division. The former is bluish in colour, the latter ferruginous and tapered towards the extremity, which extends as far outward as the tips of the bristles. Occasionally the dorsal cirrus of the second segment shows a small inner filament. The ventral cirrus is very short, but it possesses a similar structure. It is attached to the posterior border of the ventral curve of the foot.

The dorsal bristles form a curved row, with the convexity directed forward, and consist of two kinds, viz., a stout series with grooved and serrated tips (Pl. IIA. fig. 8), and a longer series with finely tapered, curved tips, the latter being minutely roughened on the convex side with small points (Pl. IIA. fig. 9). The shafts of the longer kind are much more granular and opaque than in the stouter shorter series. The tips of the spinose bristles are peculiarly curved, and the surface from which the rough points spring would seem to be somewhat flattened. The points resemble the bases of a brush-like series of spikes (Pl. IA. fig. 16). The ventral bristles, again, are few in number and comparatively short, but powerfully developed (Pl. IIA. fig. 10). The tip of each is strongly curved (hook-like), and marked by a series of fine striæ in the opaque or whitish portion, these being continued downward on the posterior part of the bristle.

The spines of both dorsal and ventral divisions of the foot are peculiarly expanded at the tip, and each differs from the other in the form of the dilatation. Thus the dorsal (Pl. IIA. fig. 11) has a more elongated tip; while the ventral (Pl. IIA. fig. 12) has a larger and shorter tip, and the entire organ is stronger. Besides the bristles and spines projecting externally, each bristle-sheath has various spines and bristles in course of development, and each from its earliest condition bears its characteristic features. The solid tips are the first parts to appear, and in the case of the ventral series the bristles are in pairs with a spine at intervals.

The anus in most of the specimens is a great circular opening, embracing several segments at the posterior end of the body; indeed the size of the aperture is a remarkable feature. Internally the mucous membrane forms a prominent mass, occasionally with a somewhat radiate arrangement of rugæ. Pallas states that the anus is bilabiate, and in some conditions the description is very appropriate. Most of the examples in the present case may have lost the tip of the tail. The large size of the anus would indicate a peculiarity in the digestive function.

In the intestinal canal fragments of sessile-eyed Crustacea were found in considerable abundance, generally mixed with brownish-purple débris. The cirri of barnacles were also common, and occasionally a valve of the same animal, so that they would appear to feed on them; they would readily be procured on the floating timber.

The general structure of the proboscis conforms to that in *Chloeia*. The alimentary

canal is capacious, its first division being largely dilated and covered by transverse rugæ. A powerful layer of longitudinal muscular fibres is developed externally at the posterior part of the proboscis.

The central organ of the nervous system occurs in the caruncular region, a little in front of the median tentacle, in the form of a bilobed mass. It is interesting that the separate nerve-cords in front are smaller in proportion than the trunks after they form the double cord. The nervous system on the whole is feebly developed.

On each side, in a line with the median tentacle, is a large ocular (?) organ, which appears to be single. Section, however, shows that there are two deep centres of the pigment, and that there is a tendency to facets on the surface. Each mass forms a prominent oval projection, and appears minutely dotted under a lens.

On the dorsum of the second body-segment are a number of prominent warty rugæ of the hypoderm.

Two small specimens from the Atlantic, named by Prof. Grube *Amphinome vagans*, differ in no respect from the foregoing. They came from the Godeffroy Museum. This species is probably the *Amphinome pallasii* of De Quatrefages,[1] from the Azores and the Antilles, and is certainly the *Pleione tetraeda* of M.-Edwards.[2]

Hermodice, Kinberg.

Hermodice carunculata, Pallas (Pl. V.; Pl. IIIA. figs. 1–4).

Hermodice carunculata, Auctorum. It is doubtful whether Seba's Millepod amarina amboinensis, Seba, Thes. Ser. Nat., i., tab. lxxxviii. p. 131, be the same.

Habitat.—A large specimen measuring upwards of a foot in length was procured at the surface of the sea near the Bermudas, while a bleached example about a fourth the length comes from the littoral region of the same islands. Two others were found at St. Vincent, Cape Verde Islands, in July 1873; and two were collected at St. Thomas, West Indies, in March of the same year.

In those best preserved the characteristic features are the dull greenish or slate-bluish finely corrugated dorsum, the small size of the branchial tufts as compared with *Amphinome rostrata*, the pale buff of the ventral surface, and the alternation of the dorsal processes.

The body is even more distinctly tetragonal than in *Amphinome rostrata*, this character being heightened by the issue of the bristles from the prominent angles. The diminution of the body posteriorly is well marked. The segments are clearly defined, and range from sixty-seven to seventy, and in the large example to one hundred and fifty-five. On the ventral surface a large vessel runs along the median line and is visible externally. The anus opens as a somewhat symmetrically corrugated orifice on the dorsum, and there is a peculiar papilla, projecting posteriorly at the lower border.

[1] Annelés, i. p. 394. [2] Règne Anim. ill., pl. viii. *bis*, fig. 1.

The head is at once differentiated from that in *Amphinome* by the greater caruncle and the modification of the anterior border of the snout. Instead of the broad median region anteriorly there is in this form only the small rounded upper surface of the pre-labial folds. The caruncle is much larger than in *Amphinome*, and extends to the posterior border of the fourth body-segment. It is composed of a series of folds (eight in number), each of which is again deeply notched in the preparation, so that it resembles a rope with its strands. The primary folds run from behind forward and outward, and are alternate with regard to the central axis. The median tentacle arises immediately in front of the latter, from the prominent top of the head. It is much larger than the two tentacular cirri which lie outside and in front of it, or than the inferior cirri which spring from the sides of the labial folds beneath. The eyes are two on each side, and by no means large. One is situated in a line with the anterior margin of the median tentacle; the other has nearly the same relation to the posterior border of the organ. In one a third pigment-spot occurred on the left, near the base of the tentacle posteriorly. In the large example the anterior pair of eyes are brownish, the posterior black. The top of the head and the caruncle are minutely flecked with whitish grains.

The mouth opens inferiorly in the middle line between the third and fifth segments. The thick pre-oral folds, so well marked in some of the genera, are here comparatively small, and chiefly occupy the middle of the first segment. There is a decided interval between their posterior border and the oral aperture. The pouting masses of buccal tissue are softer and more rugose than in *Amphinome*.

The relative difference in the size of the branchiæ forms a characteristic feature when contrasted with *Amphinome;* moreover, they commence on the first bristled or body-segment, the first three or four being less than the others. Each tuft (when fully formed) consists of two main divisions, of a pale greenish colour, an outer smaller, in the form of a separate process immediately behind the bristle-tuft, and a larger inner arbuscle which divides into several main branches with short terminal processes. Three seems to be a common number in the terminal groups. The whole organ is minutely dotted with white grains, which are densest on the posterior aspect of the process, and is somewhat dichotomously branched. The branchiæ are continued to the posterior extremity of the body, and only slightly diminished in that region.

The dorsal bristle-tufts are distinguished from those of *Amphinome* and the others yet examined by their evidently alternate arrangement. So well-marked is this feature that at first sight the dorsal series seems to be double. The bristles are very fine and slender, and in this respect in strong contrast to those of *Chloeia*, *Amphinome*, and *Notopygos*. Their beautiful asbestos-like whiteness is also striking, as well as their slightly twisted appearance as they emerge from the socket, like a tuft of camel's hair from the quill of a hair-pencil. They do not spring from a raised papilla as in *Chloeia* and *Notopygos*, but emerge from a pit. Each tuft consists of a dense series of

simple, long, slender, and finely tapered bristles which have the tips (Pl. IIIA. fig. 1) minutely roughened, from the point a considerable way downward. Such microscopic processes on the surface are homologous with the bolder condition in *Amphinome*. The other kind of bristle is distinctly serrated at the tip (Pl. IIIA. fig. 2), upwards of twenty teeth being visible, and a fold of the chitine passes from the apex of each serrature downward like a hood. These bristles show in a remarkable degree the albuminous contents (the brownish masses of Grube) after drying, for each bristle collapses, and the contents form nodular masses all over the exterior. Glacial acetic acid causes many bubbles of gas to escape from the central cavity of the bristles, but has no effect on the globules. Sulphuric ether and absolute alcohol show as little action on the latter as the acid. They would therefore appear to be albuminous, though their appearance is decidedly fatty.

The ventral bristles are all of one kind (Pl. IIIA. fig. 4, which represents one of the inferior bristles), presenting a slightly striated shaft and a curved, slightly bifid tip, while a series of very distinct serrations occur on the edge of the latter, from the tip to the spur. Like the dorsal bristles, each of the points or serrations does not indicate merely a spike, but also a slight wing. The upper bristles possess much longer and more slender tips, and the spike is more distinct (Pl. IIIA. fig. 3). In the bleached example from Bermuda the serrations and tips of the ventral bristles are much abraded, so that only those sheltered by position show the ordinary structure. The animal, therefore, makes some use of them, for progression or otherwise, and probably under stones. In the specimens from St. Vincent, Cape Verde Islands, these bristles form a somewhat regular vertical row, the longest bristles (with the longest tips) being superior. In the very large example many of the ventral bristles are more distinctly bifid than usual.

The dorsal cirrus arises behind the bristle-papilla, and has a very attenuated tip. It is composed of a basal and a distal division. The ventral cirrus is smaller and occupies the ordinary position behind the ventral bristle-tuft. Both increase in length posteriorly.

In the stomach of the large specimen were muddy masses containing sponge-spicules, Diatoms, Radiolarians, sand-grains, fragments of chitine, and cellular and granular débris.

The nerve-cords are quite within the body-wall, for the oblique muscles meet in the middle line beneath them, the fibres apparently decussating with the circular muscular coat. Connective tissue and granular matter, moreover, separate them from the muscular fibres, and in the sections the perivisceral corpuscles also often intervene. A considerable hypodermic canal occurs immediately below the decussation just mentioned. This seems to be filled with opaque material. When a section is made in the line of the ganglia, a large nerve-cord on each side is seen to arise from the cells in their interior. The upper and lower walls are strengthened by a dense capsule. Superiorly also a peculiar conical

band rests on the cords, the lower part (next the ganglion) being more translucent and granular, the outer more opaque.

The perivisceral lining is bordered with large nucleated granular cells—the perivisceral corpuscles.

The proboscis has the usual structure.

This species, subsequently to the remarks of Pallas and Savigny, formed the subject of the late Prof. Grube's inaugural dissertation,[1] chiefly with regard to the digestive, vascular, and nervous systems. It is a characteristic western form. The *Amphinome gigas* in the collection of the British Museum is this species from the Atlantic Ocean.

Prof. Grube mentioned it as one of the Annelids of Madeira in 1857, and it has since been found there by Prof. Langerhans, whose figures[2] of the bristles, however, deviate from those procured by the Challenger, since the serrations of both dorsal and ventral bristles are much fewer. This author notes the calcareous nature of the bristles, which in this respect agree with those of others of the group, *e.g.*, *Chloeia fucata*.[3] The form described by Dr. Baird under the name of *Amphinome didymobranchiata*,[4] from the Island of Ascension, seems to approach this genus (*Hermodice*) in the size and structure of the caruncle and in other particulars.

Eurythoë, Kinberg.

Eurythoë pacifica, Kinberg? (Pl. II. figs. 3, 4; Pl. III. fig. 3; Pl. IIA. fig. 13; Pl. IIIA. figs. 5–9).

Habitat.—Several specimens occurred at Bermuda between tide-marks. It seems to extend to both great oceans, the coral reefs of the Pacific being a favourite haunt. Grube[5] describes a form from Tahiti and the Nicobar Islands, which he doubtfully refers to the same species. Kinberg's specimens came from the shores of the islands of Eimeo and Foua.

The body is somewhat flattened and rectangular in section, slightly pointed in front, and gradually diminished posteriorly. The specimens are comparatively small, the longest measuring about 65 mm., with a breadth of 7 mm. One had one hundred and five body-segments.

The snout differs from that in *Hermodice* in having a broad lobe in front, shaped somewhat like a hoof, and bearing the two tentacular cirri, one pair superiorly in front of the eyes, and another inferiorly toward the posterior border. The head carries the rather elongated and linear caruncle, which impinges on the fourth body-segment, and has anteriorly the median tentacle ending in a filiform tip, the organ being

[1] De Pleione carunculata, *Regiomontii Prussorum*, 1837.
[2] Die Wurmfauna Madeiras, *Zeitschr. f. wiss. Zool.*, xxxiii. p. 277, Taf. xiv. fig. 8.
[3] *Trans. Zool. Soc. Lond.*, ix. p. 396.
[4] *Trans. Linn. Soc. Lond.*, xxiv. p. 449, pl. xlv.
[5] Annel. Novara-Exped., p. 8.

shorter than the foregoing cirri. The caruncle shows a dorsal ridge, indistinctly separated from the horizontal basal portion, and thus decidedly different from that in *Hermodice*. The larger pair of eyes is situated in a line with the anterior margin of the tentacle, and the smaller a short distance behind. The four mark out an oblong, probably nearly a square in life.

The mouth opens on the ventral surface at the anterior border of the fourth body-segment, the central region in front being occupied by the wedge-like lobes which pass forward to form the snout, and the sides by the convergent lines of the three anterior body-rings. The anus occupies the dorsum of about three of the small terminal segments, and has posteriorly a prominent papilla. In the intestinal canal of specimens from the Seychelles are masses of algæ and considerable pieces of coral and nullipore. In the present case pieces of olive-brown sea-weed are most conspicuous.

The branchiæ commence on the second body-segment each as a tuft of two processes. They are continued along the dorsum as somewhat less conspicuous organs than in *Hermodice*. When fully formed each tuft consists of a series of slightly divided processes, chiefly after a dichotomous type. They are continued to the last or the penultimate segment. A peculiar infusorial parasite occurs in numbers on the branchiæ.

The dorsal bristles consist (1) of a few simple distinctly curved bristles (Pl. IIIA. fig. 5), which are frequently absent in the preparations; (2) of a large group of characteristic bristles with slightly bifid tips (Pl. IIIA. fig. 6), one of the divisions being a mere spur, while the other is extremely elongated and tapering, with serrations along the inner edge; and (3) of a well-marked serrated series (Pl. IIIA. fig. 7), with the terminal portion striated in a peculiar manner.

The ventral bristles are bifid, one or two superiorly (Pl. IIIA. fig. 8) having slender shafts and very long tips, with serrations on the inner edge; while the majority have stout tips (Pl. IIIA. fig. 9) with three or four serrations on the inner margin. Anteriorly the tips of these bristles are somewhat longer. Amongst the inferior bristles are some short simple spines with a dilatation in the centre (Pl. IIA. fig. 13). Similar forms are also shown by Kinberg in *Eurythoë corallina*.[1] These hastate spines have the tips projecting only a short distance beyond the cuticle, the stoutest part of the bristle being internal.

The dorsal cirrus has the usual basal segment, and though fairly developed does not project quite as far as the bristles. It becomes more elongated posteriorly. The ventral is a short process in the ordinary position.

The arrangement of the nerve-trunks differs from that in *Chloëia*, since the oblique muscles decussate beneath them. In some sections (anterior) a regularly arranged series of longitudinal fibres occurs within the circular muscular layer, so that the nerve-cords are carried further inward at these points.

[1] Freg. Eugen. Resa, Tab. xii. fig. 12.

This species agrees with the *Eurythoë pacifica*, Kinberg, as named by Prof. Grube in the Godeffroy Collection, except in slight particulars due to indifferent preservation and the wear of the bristles in the larger specimens. The same author, moreover, had under examination other examples from Tahiti and the Nicobar Islands.[1] Some from Samoa measure about a foot in spirit. The same form was found by Prof. Percival Wright in the Seychelles, and it appears to be identical with the *Amphinome bruguieresi* of De Quatrefages.[2] The *Eurythoë alcyonia* of Savigny from the Red Sea (Dr. Rüppell) is also closely allied, to judge from an example in the British Museum. The ventral bristles are smooth. A near form is the *Amphinome alba*, Baird, the ventral bristles of which are mostly smooth, only one showing a serration. In the British Museum the *Eurythoë* (*Amphinome*) *complanata* from the West Indies seems to have the tip of the ventral bristles quite smooth.

In the present state of our knowledge it is almost impossible to diagnose the forms referred to by the various authors, and it is probable that the same species has received several names. The laxity in this respect is shown by the fact that Kinberg in his description states that the ventral bristles are smooth, while his artist figures them with serrations.

One of the Ceylonese individuals of *Eurythoë pacifica* in the British Museum shows a few notches in the ventral bristles towards the tip, but no distinct serrations.

Eurythoë pacifica, var. *levukaensis* (Pl. XVI. fig. 5; Pl. IIA. fig. 14; Pl. IIIA. figs. 10–12).

Habitat.—Levuka, Fiji.

The examples are small, the longest measuring about 18 mm., and the diameter of the fragmentary larger specimen being 3 mm. One has fifty segments.

It is distinguished from the foregoing by the much more distinct segmentation, the rings being both larger and more deeply cut. The snout is more evidently bi-lobed, and the caruncle is proportionally broader, but it is doubtful how much reliance can be placed on spirit-preparations in this respect. The median tentacle is smaller than in either of the others. The eyes occupy the ordinary position, and are of a dull brown colour The anterior pair (as usual) are considerably larger. The caruncle impinges posteriorly on the fourth segment. Inferiorly the mouth opens at the anterior border of the fourth body-segment, the three anterior somites sloping obliquely from the sides inward. The median folds (præstomium) show a distinct central hollow in front, though in this respect it agrees with the previous form.

The only indication of branchiæ on the first body-segment is an eminence at the base of the cirrus, but on the next is an inner tuft of two or three erect processes,

[1] Annel. Novara-Exped., Zool. Th., Bd. ii. p. 8. (sep. Abd.).

[2] Annelés, i. p. 398.

and an outer of two filaments. When fully formed the organs differ from those of the previous form by their greater size and more evident divisions, features borne out on microscopic examination. The processes are larger and longer, as well as more distinctly lanceolate at the tip, whereas in the former case they are blunt. The branchiæ are continued to the posterior end.

In examining the dorsal bristles, a feature at once strikes the observer, viz., their greater translucency and much more flexible nature. The bifid kind (Pl. IIIA. fig. 10) have somewhat larger shafts than in the former examples, and the serrations on the inner side of the tip are less distinct. The serrated kind (Pl. IIIA. fig. 11 represents an average specimen) is not marked by distinct lines or grooves toward the tip as in the previous form, and the teeth are less prominent. These bristles seem to be more numerous in the tuft than in the typical *Eurythoë pacifica*. Another feature is the great prominence of the smooth curved form (Pl. IIIA. fig. 5) in the foregoing specimens, and their comparative paucity and slenderness in this.

The ventral bristles are on the whole more translucent, and have the tips more dilated than in *Eurythoë pacifica* proper. One of the average bristles from the anterior third of the body is shown in Pl. IIIA. fig. 12, though it has to be mentioned that the number of serrations on the inner edge of the tip is sometimes three or four in the anterior feet. If the bristle is slightly turned round the tip appears narrower, so that there is lateral flattening. The hastate spine (Pl. IIA. fig. 14) is somewhat larger than in the previous form. The elongated series, corresponding to Pl. IIIA. fig. 8, is also present, and closely approaches the latter. The resemblance in the characters of the bristles is striking, and it has been thought unnecessary to make specific separation.

The nerve-cords have the same relations as in the preceding form, and the alternation of the ventral longitudinal muscles is even more apparent. This alternate passage inward and outward of the ventral longitudinal muscle is noteworthy. A small canal exists in the central line of the hypoderm. It is interesting to find the canal independent of the nerve-cords.

Hipponoë, Audouin and Milne-Edwards.

Hipponoë gaudichaudi, Audouin and Milne-Edwards (Pl.I. fig. 5; Pl. IV. fig. 3; Pl. IIIA. figs. 13–17).

Habitat.—Several examples occurred on a log at the surface of the sea, 100 miles north of Bermuda, 28th May 1873. Another was found adherent to *Lepas fascicularis* on the surface of the North Pacific, 6th July 1875.

This form certainly presents a very considerable divergence from the Amphinomidæ in external appearance. The body is much more flattened, somewhat fusiform in outline, and composed of about thirty-two boldly-marked segments, including head and tail. The length of the largest specimen is 24 mm., and its breadth fully 5 mm.

Instead of the preoral folds the minute head of the animal forms the anterior border of the snout. In shape it is somewhat ovoid or occasionally lozenge-shaped, from the pointed nature of the anterior edge. It bears on the dorsal surface four eyes, all nearly equal in size, and forming a rectangle, those of each pair being close together, thus diverging from the ordinary type in the Amphinomidæ. Somewhat behind the posterior pair of eyes is the long median tentacle, a simple subulate process which projects backward as far as the middle of the second body-segment. A little in front of the eyes at each side is a tentacular cirrus, considerably shorter than the foregoing; while on either side of the tip of the snout is another of similar length. The mouth opens on the under surface at the anterior border of the second body-segment, and a flat surface, marked by two narrow longitudinal ridges, leads forward to the tip of the snout. The posterior end terminates in a bulbous anus, which in some appears pediculated, from the constriction immediately in front.

The branchiæ commence on the fourth body-segment as a considerable tuft in each case, and when fully developed consist of a slightly divided arbuscle richly coated with cilia, and thus diverging from the condition in the Amphinomidæ. Moreover, the hypoderm of the organ presents a lax and cellular appearance, while the cuticle is very thin on the distal processes. In transverse section the translucent areolar hypoderm is especially marked at the base of the organ. The central area is occupied by large granular globules, apparently coagulated blood, and the latter also occurs in the two channels in the distal branches, which are irregularly dichotomous. The cilia appear to form several rows on the sides of the processes. The branchiæ in the *Hipponoë cranchii* of Baird are decidedly larger.

The dorsal bristles form a broad fan-like tuft at the anterior border of each segment, extending from the dorsal to the ventral aspect of the foot, and with the slight concavity of the curve directed backward. The bristles are translucent, simple, and tapering (Pl. IIIA. fig. 13). The outline of the lower part of the shaft (Pl. IIIA. fig. 16) is slightly irregular, from indications of the points or spikes, which become more distinct distally, and there is a single median streak probably due to a ridge externally, the rest of the surface being marked by fine longitudinal lines. In the figure the shaft is compressed and cracked, but the spikes are thus rendered more evident. In its normal condition the lower part of the shaft appears as a clear tubular bristle (Pl. IIIA. fig. 15), only a slight roughness along one of the margins indicating the spikes. The mere evaporation of a small portion of the water between the cover and the slide suffices to destroy the outline by breaking the tube and causing it to resemble fig. 16. The tips of some are peculiarly bifid (Pl. IIIA. fig. 14). Acetic acid has very little effect on these bristles except in rendering them more translucent. No bubbles of gas escape, and they are less brittle than in the Amphinomidæ; so that on the whole they do not seem to be of the same characteristic calcareous nature.

The dorsal surface of the body is slightly convex, whereas the ventral is marked by a deep median groove from the mouth to the posterior extremity. On the prominent portion of the second body-segment, bounding the lateral and posterior part of the mouth, on each side is a slight pit containing the characteristic hooks of the species. The succeeding segments show a similar fossa on each side, about midway between the median groove and the external border. The hooks (Pl. IIIA. fig. 17) are strictly bifid, with a long curved sharp terminal claw, and a shorter blunt one beneath; the former being marked by coarse, and the latter by fine striæ. The deep pits with their prominent fleshy margins are probably of importance in keeping the hooks always sharp and uninjured. The latter are perhaps capable of a certain amount of extrusion when the animal wishes to anchor itself to floating timber or other structures. In *Hipponoë cranchii*, Baird, the hooks quite differ in structure.

A single cirrus of considerable size, in the form of a simple subulate process, is situated at the inferior margin and slightly behind the bristle-tuft, and therefore is best seen from the ventral surface.

Posteriorly the body terminates in a simple rounded papilla bearing the anus on the dorsum. The last pair of branchiæ occur at each side of the papilla.

The specimens are all so distended with ova that the structure of the body-wall cannot be seen with clearness. The chief points noticed are the great thickness and translucency of the hypoderm, which is almost Nemertean in its areolar and cellular condition, along the ventral and lateral surfaces; but on the dorsum between the bristle-bundles it is much thinner and more compact. Moreover, the cuticle along the ventral region is not readily distinguished as a separate layer (the surface resembling that in the Nemertean which has a ciliated coat); while on the dorsum the cuticle is of considerable thickness. There is thus some evident difference in the physiology of the surfaces. Beneath the hypoderm is the circular muscular coat. The longitudinal and oblique muscles were so interfered with by the ova in the somewhat softened preparation, that nothing definite could be determined. So far as could be observed, the nerves seemed to lie above the oblique muscles.

In the example from the North Pacific there are twenty-four segments, including head and tail. The branchiæ commence on the left side on the second, as a simple process, and on the right on the fourth segment as an arbuscle. The ventral hooks and dorsal bristles correspond in minute structure with those from Bermuda.

Dr. Baird speaks of certain small parasitic animals being attached to the under surface of the specimens in the British Musuem. None occurred in the present forms. The species appears to have a very wide range, stretching from Port Jackson, Australia, to Madeira and the Bermudas. Dr. Baird,[1] has the credit of correcting the erroneous descriptions of his predecessors in regard to the eyes, hooks, and other parts. It is remarkable

[1] *Proc. Linn. Soc. Lond.*, vol. x. p. 239.

that the two former organs escaped the notice of MM. Audouin and Milne-Edwards, in their original description of the species from Port Jackson, where it was obtained by Capt. Freycinet in his celebrated voyage round the world. In two instances in the British Museum the specimens occurred amongst barnacles.

Family Aphroditidæ.

The descriptions of the family given by Kinberg and other authors render it unnecessary to define it on the present occasion. All the genera procured in the Expedition of the Challenger fall under those already described, yet there are some forms which, from their intermediate structure, help to clear up the relationships between *Aphrodita*, *Lætmonice*, and *Hermione*, and especially indicate the steps between the two first mentioned. Something of the same kind, however, is brought to light without traversing the great oceans, viz., in watching the development of the bristles in the ventral branch of *Hermione hystrix*.

Those authors who, like Savigny, Milne-Edwards, De Quatrefages, Grube, and Ehlers place the Aphroditidæ, Polynoidæ, Acœtidæ, and Sigalionidæ in one family have certain grounds for this step. Thus all have biramous segments, all have ventral cirri on every foot; the scales are borne by similar segments; the head has two eyes on each side, a median tentacle, a pair of palpi, and four tentacular cirri. Moreover, there is a certain agreement in regard to the arrangement and relation of the great nerve-cords, which in *Aphrodita* occur in a transversely elongated space between the ventral attachments of the oblique muscles, bounded externally by the hypodermic basement-tissue of the cuticle; in *Polynoë* they occupy a hypodermic area between the ventral longitudinal muscles, the oblique muscles piercing the vertical at the upper and outer angle of the space, and being attached externally and superiorly to the cords. In the Acœtidæ they are situated in the hypodermic region between the ventral longitudinal muscles (which are closer than in the Polynoidæ), a thin layer of the former occurring between them and the cuticle. The great oblique muscles pass down to their upper and outer border. Lastly, in the Sigalionidæ the space between the ventral longitudinal muscles is still more narrowed than in the previous group, and the hypodermic area for the nerves is thus increased in depth. Superiorly the arch is completely covered by the insertions of the vertical and oblique muscles; and the latter do not pierce the former (which occupy the middle line), but are attached to the basement-tissue below them on each side of the nerve-area. It will be observed that there is a gradational narrowing of the ventral longitudinal muscles between the first and last mentioned groups.

On the other hand there are fair reasons why several authors adhere to the arrangement of these groups in separate families. Thus, for instance, the Polynoidæ diverge

considerably from the Aphroditidæ in the structure of the head, the arrangement of the eyes, the armature of the proboscis, the form of the bristles, the presence of the antennæ (lateral tentacles of Grube), and other points, including the relationships of the great nerve-cords (which in the Aphroditidæ have the ganglia of the three first feet separate, *i.e.*, not united by transverse commissures), while such features are common to the rest. Taking the known facts into consideration, it would appear to be prudent at present to leave the various groups above mentioned in separate families as Malmgren has done.

The family of the Aphroditidæ is well represented in the collection, as may be inferred when it is stated that Kinberg in his Annelids of the Voyage of the Swedish frigate "Eugenie" mentions seven; that only two are noticed by Grube in Semper's great Philippine collection, and the same number (two) amongst the Annelids dredged in the German exploring ship "Gazelle"; further, that none occur in the same author's Annulata Œrstediana, and none in Schmarda's series; while the present collection affords no less than thirteen.

All the Aphroditidæ are deep-water forms, a feature at once dividing them from the other groups formerly mentioned. They are evidently active feeders, though their opportunities for such may sometimes be limited.

Mr. Haswell[1] has recently added to our knowledge of the segmental organs of *Aphrodita*. Their external apertures, he observes, are situated on the ventral surface close to the base of the parapodia, but there is no perforated papilla as in *Polynoë*. The segmental organs consist of small, flattened, and somewhat sigmoid sacs.

Aphrodita, Linnæus.

Aphrodita aculeata, Linnæus.

Habitat.—Dredged by H.M.S. "Knight Errant," in the Færöe Channel at Station 7, August 12, 1880, in 530 fathoms; bottom temperature 46°·5, surface temperature 57°; ooze. A small specimen.

Aphrodita australis, Baird (Pl. VII. figs. 6, 7; Pl. VIA. figs. 4–7).

Aphrodita australis, Baird, Journ. Linn. Soc. Lond., vol. viii. p. 176, 1865.

Habitat.—Dredged at Station 163B, off Port Jackson, Australia, 3rd June 1874; lat. 33° 51′ 15″ S., long. 151° 22′ 15″ W.; depth, 35 fathoms; bottom temperature 63°, surface temperature 69°; hard ground.

The single young specimen is about 26 mm. in length and 18 mm. in breadth. Contrasted with an example of *Aphrodita aculeata* of the same length, it is very much broader, while the more abundant lateral hairs give it a woolly aspect. The dorsal felt

[1] *Proc. Linn. Soc. N. S. Wales*, vol. vii. p. 608.

is coated with greyish mud, amongst which a *Sabellaria* was found, so that there must have been soft parts amongst the rocks. The colour of the beautiful lateral hairs differs from that of the common species, being of a more delicate green, the whole indeed inclining to a mixed pale bluish appearance. These lateral hairs are also much longer. The segments are forty-two, the posterior region, which as usual in the group is distinctly narrowed, bearing a proportionally larger number. The dorsal felt is extremely tough and dense, more so than in *Aphrodita aculeata*. The head is a rounder and comparatively larger organ than in the latter, having in front a short blunt conical tentacle or papilla, immediately behind which (in a transverse line) are two eyes on each side, the anterior pair being wider apart than the posterior. They are small but distinct black points, entirely sessile.

The body is more depressed than in *Aphrodita aculeata*, and instead of the rows of stiff, sharp, dark brown spines which flank the sides in the latter, a series of light bronze-coloured spines project outwards amongst the hairs. The tips of these do not taper much, but end in somewhat broad points (Pl. VIA. fig. 4), which are covered with minute chitinous spikes, so that the surface is rasp-like. In consequence of this structure the tips are generally coated with extraneous organisms of various kinds. The inner tufts of bristles, which curve round and backward amongst the felt of the dorsum, are broad at the base but taper to a slender tip, also marked by slight roughnesses or points. A translucent filiform prolongation of the tip is common (Pl. VIA. fig. 5).

The ventral bristles anteriorly are for the most part dart-shaped (Pl. VIA. fig. 7), but the tip is seldom entire. It is easy to pass from this form to the slightly hairy kinds as we proceed backward, and then to the form typical of the group (Pl. VIA. fig. 6), the figure representing one of the smaller bristles from the inferior division of the ventral branch of the foot, these being somewhat less liable to injury than the strong upper ones. In the latter the tips are almost all broken, a mere trace of the hairy part remaining. Posteriorly the ends of the stout superior ventral bristles are rather more tapered.

The dense tufts of fine iridescent bristles which spring from the middle of each foot are longer than in *Aphrodita aculeata*, and on the whole the basal regions of the shafts are more slender. They taper to an extremely fine tip.

The dorsal cirri occur on alternate feet, and are long and finely tapered toward the tip, which is slightly clavate. The surface is smooth, while internally a very distinct muscular band occupies the middle. A peculiar network of fibres, apparently sub-hypodermic, is also present. The ventral cirri have the same position as in *Aphrodita aculeata*, but the tips are more finely tapered and more definitely bulbous. Though the cirri of the dorsum are alternate in *Aphrodita*, the alternate arrangement of the bristles present in *Lætmonice* does not occur.

Dr. Baird does not mention eyes (though they are present) in his examples, which were considerably larger than the foregoing. They came from Port Lincoln and Van

Dieman's Land. The larger example, in the British Museum, measures upwards of 4 inches in length, and an inch and a half in transverse diameter at the widest part. It is much tapered posteriorly. The coarse nature of the dorsal felt alluded to above is conspicuous in this large specimen. The large flattened yellowish-brown bristles with a metallic lustre, curve backward over the felt. The sides are furnished with the long iridescent hairs, which on the ventral surface have a rusty brownish hue. The dorsal and ventral cirri agree in having a dilatation below the slender clavate tip, a feature not seen in the small example from the Challenger. The dorsal bristles on the whole agree with the latter in structure, but the ventral show no trace of the woolly region, probably from friction. A curious arenaceous Foraminifer is parasitic on the middle of the ventral region of the body. The other large specimen (from Van Dieman's Land) unfortunately had been sent in a dried condition, so that it is doubtful if it quite agrees with the former. All the dorsal bristles appear to be much worn. Mr. Haswell, in his excellent account of the Australian Aphroditaceæ,[1] states that this species is not so common as the European form; indeed, he had only seen a spirit-preparation. He mentions Port Stephens in addition to the above localities.

Aphrodita echidna, De Quatrefages ? (Pl. VII. figs. 1, 2; Pl. VIA. figs. 2, 3).

Aphrodita echidna, De Quatrefages, Annelés, i. p. 197.

Habitat.—Trawled at Station 307 (in the Strait of Magellan), January 4, 1876; lat. 49° 24′ 30″ S., long. 74° 23′ 30″ W.; depth, 140 fathoms; bottom temperature 7°·6 C., surface temperature 53°·0; blue mud. Also at Station 309 in the same Strait, January 8, 1876; lat. 50° 56′ S., long. 74° 15′ W.; depth, 40 fathoms; blue mud.

The body of the large example measures about 53 mm., and has a diameter of 25 mm. at its widest part, viz., the middle.

The dorsum has a dull muddy green hue, marked at the sides by the points of the spines which barely project through the investment. The lateral regions are of a dusky ferruginous colour, and the same tint occurs on the anterior third of the ventral surface. The odour of the specimens is peculiar. The segments are about thirty-five. Numerous long-stalked Pedicellinæ occurred on the large specimen.

The head is smooth, prominent, and rounded, with the tentacle in the median line at the anterior border; the tentacle is barely the length of the head, and the swelling below the tip of the long distal division seems to be slight. It is covered with a blackish deposit. No eyes are visible. The palpi have the usual length.

The dorsal felt is formed of very distinct and nearly equal fibres, which have the ordinary hooked tip. The dorsal bristles (Pl. VIA. fig. 2) are short, and for the most

[1] *Proc. Linn. Soc. N. S. Wales*, vol. vii., June 1882.

part enveloped by the felt, and they constitute a kind of double row along the dorsum. The shafts of these are somewhat ovoid in transverse section in the middle, and more flattened towards the tip. Their texture is brittle, and they have the usual lustrous brown appearance. Below the dorsal spines is a tuft of very long, simple, flexible bristles, generally coated from base to apex with fine mud. They are most conspicuous posteriorly, forming a dense mass on each side superiorly.

The envelopment of the dorsal spines by the felt causes the upper ventral bristles to appear very prominent. They resemble stiff brown spines with a slightly pilose tip, which is frequently broken. The inferior group (a short distance outside the cirrus) are much more slender, but conform to the same type, their distal regions remaining more perfect from their sheltered position (Pl. VIA. fig. 3—one of the inferior or smaller group, it may be with the tip in process of reproduction). Anteriorly, as in allied forms, the tips of the bristles are in many cases quite smooth. The internal portion of the bristle is also less brittle than the exterior, the former remaining as a long appendage after fracture of the latter.

The dorsal cirrus is long and tapering, and ends in a slightly enlarged tip. Its surface, with the exception of a microscopic palpocil or minute papilla or two, appears to be smooth. The ventral cirrus is subulate, tapering from base to apex, and with more numerous papillæ. The tip appears also to be slightly bulbous, but it must be recollected that spirit greatly alters these delicate structures.

The scales as usual are fifteen pairs, and both dorsal and ventral surfaces are coated with a ferruginous deposit. A few microscopic papillæ occur on the upper surface. Some fragments of long hair-like greenish confervæ were attached to the felt on the dorsum of one specimen.

The proboscis (*pharynx exsertilis* of Kinberg) and alimentary canal conform to the typical structure. The former is much compressed laterally. The body-wall appears to agree in structure with *Aphrodita aculeata*, except that the dorsal cuticular papillæ are somewhat longer and have simple pointed tips, whereas in *Aphrodita aculeata* they have a slight terminal button or dilatation. The nerve-cords occupy the middle of the same wide area between the oblique muscles inferiorly.

In one specimen the intestinal canal contained much granular débris, forming a pulpy mass, in which shreds of cuticle and numerous bristles apparently of one of the Spionidæ occurred.

This differs both from the *Aphrodita alta* and the *Aphrodita longicornis* of Kinberg, the former coming from the South Atlantic near Rio Janeiro, and the latter from the same ocean off the River Plate. From the first it is distinguished by the prominent spines of the dorsum (they are hidden under the felt in Kinberg's form), the absence of the elevated ocular region on each side, and the shape of the tentacle, which has a shorter and wider distal region in *Aphrodita alta*; whilst from *Aphrodita longicornis* it diverges

both in regard to the shape and length of the tentacle (the organ being much shorter in *Aphrodita echidna*), the form of the head and the absence of eyes. There is nothing in the description of the *Aphrodita echidna* of M. de Quatrefages to give certainty in contrasting it with others, but it agrees with the present form in having the felt in a single layer, transfixed by the dark brown spines, and in all probability the forms are the same. Nothing further is known of the French specimen than that it was procured off South America by A. d'Orbigny.

Aphrodita intermedia, n. sp. (Pl. I. fig. 6; Pl. VIA. fig. 1).

Dredged at Station 23A, off Sombrero Island, West Indies; lat. 18° 26′ N., long. 63° 31′ 15″ W.; depth, 460 fathoms; Pteropod ooze: also at Station 2A, off Culebra Island, West Indies, lat. 18° 38′ 30″ N., long. 65° 5′ 30″ W.; depth, 390 fathoms; Pteropod ooze.

A minute ovoid form, measuring about 5 mm. in length and about half as much in breadth.

The whole dorsum is enveloped in a whitish coating of Foraminiferous mud, which obscures all the parts of the animal except a few of the ventral bristles along the anterior edge. In the natural condition it is, indeed, difficult to distinguish the anterior from the posterior end. The dorsal surface is convex, the ventral flattened. On the latter surface the spaces between the feet are occupied by masses of the same granular whitish material, which also in some parts projects beyond the tips. The whitish coating over the dorsum is composed of minute round spicular bodies, white sand-grains of various shapes, and débris. The layer is friable, and has only a few fine hairs in its composition. The latter have nearly the delicacy of those of *Aphrodita*, and pass from the upper division of the foot in beautiful pale iridescent tufts. They are so mixed with the little white spiked bodies and other debris, that it is difficult to detach them, especially as there are traces of minute serrations at the tip. No dorsal spines are visible in the example, a feature probably associated with the presence of the dense coating of the whitish granules.

The specimen, unfortunately, is much softened, so that a minute description of the cephalic region is difficult. It is at once seen, however, that the shape of the head corresponds to that in *Aphrodita*, not *Lætmonice*—being pear-shaped with the broad region posteriorly. Only the base of the tentacle remains in front. No eyes are visible, and no ocular peduncles. The palpi are of moderate length, and furnished with elongate papillæ, which from their pointed tips resemble spines.

The ventral bristles occur in groups of three or four, supported by a spine in the slender foot. The tip of each passes off from the shaft at a characteristic angle (Pl. VIA. fig. 1). There is a very well-marked spur as in *Lætmonice*, above which is a region densely pilose almost to the terminal hook, and placed on one side like the setose tip in the

ordinary examples of the genus just mentioned. In this remarkable form, however, the region is still further continued in the shape of a translucent filiform villose process which projects considerably beyond the hooked tip. The morphology therefore of this bristle is most interesting, since it shows an intermediate condition between the simply villose Aphroditacean bristle, and that with hook, spur, and pinnæ characteristic of *Lætmonice*.

The scales are very thin and quite smooth.

Hermione, Blainville.

Hermione hystrix (Savigny) (Pl. VIII. fig. 3).

Halithea hystrix, Savigny, Système des Annélides, p. 20.

Habitat.—Two small specimens were procured at St. Vincent, Cape Verde Islands, July 1873.

They quite agree with those from the Channel Islands, the South of England, and the Mediterranean. It seems to me that the two closely allied forms, viz., *Hermione hystrix* and *Hermione hystricella*, De Quatrefages, require further investigation.[1] The prickly dorsal bristles which pass from the great spines inward over the back occur in many of the family, and a ventral bristle with a blunt tip from *Hermione hystrix* would quite agree with Kinberg's *Hermione hystricella*, De Quatrefages. The definitions given by M. de Quatrefages as to the distinctions of the species are also open to doubt.

Lætmonice, Kinberg.

Lætmonice filicornis, Kinberg (Pl. Va. fig. 7).

Lætmonice filicornis, Kinberg, Öfversigt k. Vetensk.-Akad. Förhandl., 1855, p. 382; and Freg. Eugen. Resa, p. 7, Tab. iii. f. 7, &c.

Habitat.—A single small specimen was dredged in the Færöe Channel by H.M.S. "Knight Errant," August 12, 1880, at Station 7; lat. 50° 37′ N., long. 7° 19′ W.; depth, 530 fathoms; bottom temperature 46°·5 F., surface temperature 57°; ooze.

This form ranges over both sides of the Atlantic, being found on the shores of the United States and Canada, and off various parts of Northern Europe.

Lætmonice producta, Grube (Pl. IVa. figs. 1–8).

Lætmonice producta, Grube, Monatsber. k. Akad. zu Berlin, August 1877, p. 512.

Habitat.—A large number of all sizes were dredged off Kerguelen. One specimen at Station 149, on January 9, 1874; lat. 49° 8′ S., long. 70° 12′ E., from Accessible Bay;

[1] The *Hermione chrysocoma* of Baird is one of the Palmyraceæ, with long spinous dorsal bristles.

depth, 20 fathoms; volcanic mud. Two examples at Station 149c, Balfour Bay, Royal Sound, Kerguelen, January 19, 1874; lat. 49° 32′ S., long. 70° 0′ W.; depth, 60 fathoms; volcanic mud. A considerable number from Balfour Bay in 20 to 60 fathoms. A large number at Station 149k, on January 29, 1874, off Christmas Harbour, in 120 fathoms. Further, two small specimens were dredged at Station 151, February 7, 1874, off Heard Island; lat. 52° 59′ 30″ S., long. 73° 33′ 30″ W.; depth, 75 fathoms; volcanic mud.

Many of the specimens are large, some measuring about 100 mm. in length, and including the bristles about 50 mm. in breadth. The outline of the body is broadly fusiform. Segments from forty-four to forty-seven.

The somewhat triangular head has a slender elongated median tentacle, with a tip to which is attached a pear-shaped process, the bulbous end being superior. On each side is a prominent rounded peduncle, bearing on the dorsal surface the rather small eye. The palpi spring from the anterior border of the snout above the oral aperture, and are separated at their bases by a peculiar fimbriated lobe (facial tubercle of Kinberg), which may well subserve a tactile function. They appear smooth and glistening to the naked eye, but microscopically their whole surface is covered with pointed cuticular papillæ. The palpi are gradually tapered from base to apex, but do not appear to be quite round, a ridge occurring along their dorsal aspect. The aperture of the mouth is directed forward on the ventral surface, the post-oral cuticle being boldy ridged longitudinally. Behind the ocular peduncles a multilobate process occurs, extending forward as a boundary along the outer border, almost to the eyes. It is apparently better developed in some specimens than in others.

The first foot is directed forward and bears a double tuft of simple bristles and two cirri (tentacular cirri of Grube), the dorsal longer than the tentacle or the inferior cirrus. They are situated on the posterior surface of the foot, but as the latter is directed forward they become external. Both have a stout basal segment, and the peculiar pear-shaped process at the tip. The bristles of this foot form a sort of tufted fringe all round the anterior region—dorsally, anteriorly and ventrally, and they consist of simple tapering bristles as in *Lætmonice filicornis*, coated with mud and parasitic growths of various kinds (Pl. IVa. fig. 1, representing one from the ventral group of the first foot). It is easily noticeable that the internal structure of the bristle differs from that in the Amphinomidæ in being chitinous or fibro-chitinous throughout. The dorsal tufts are more elongated than the ventral, but they have a similar structure.

In the second foot the upper branch consists of a lower division of simple smooth bristles with finely tapered acute tips, and an upper group of stouter bristles (Pl. IVa. fig. 2) having their shafts covered with chitinous nodules, while the tip is finely pointed, though curved, and in some slightly serrated. The lower branch of the foot, again, has two groups of bristles. (1) A dense brownish series, increasing in strength

from below upward, and furnished with elongated spinous tips. The stronger upper series are much more boldly spinous than the lower, each, however, having the same armature, viz., a double row of spines from the point where the shaft begins to diminish nearly to the tip, which is bare (Pl. IVA. fig. 4). (2) The upper division shows in some only a single powerful brownish bristle (Pl. IVA. fig. 3) with a strong hook at the top of the shaft, and a series of about twenty-five spines beyond it; while the tip for a considerable distance is quite smooth and gently hooked. This kind of bristle has much more numerous processes than the homologous forms in *Lætmonice filicornis* from Shetland, yet the cirri of the latter are throughout of a more elongated character, even to the terminal pear-shaped processes.

The third foot has all the foregoing characters more decidedly developed, and the number of strong bristles in the upper group of the ventral series is increased. As in the second foot the ventral cirrus has undergone a change, being now a short process with a filiform tip, thus diverging from the elongated dorsal with its pear-shaped extremity.

The fourth foot, perhaps, presents a maximum amount of complexity in regard to its bristles. From below upward it shows—above the greatly diminished ventral cirrus—a dense series of the doubly serrated kind, the upper groups presenting a strong tooth at the commencement of the spinous row on each side, and since they are not opposite, an alternate character is impressed on the rows. From the papilla above spring one or two very powerful bristles, with a basal spur at the tip, and apparently only a single row of spines. Then from the upper papilla arises a still stronger bristle with the hooks and spines better developed. In the superior division of this foot there are no less than four groups of bristles: (1) An inferior dense series composed of bristles with comparatively smooth slender shafts and simple tips. The shafts are finely striated longitudinally (by transmitted light), and the tips are sharp, smooth, and finely tapered. (2) A vertical series of strong brown bristles (few in number), distinctly curved, with granular or minutely nodulated shafts and delicately tapered tips. (3) Immediately in front of the former is a group of simple bristles with long sharp tips like the inferior division of the dorsal series. (4) Superiorly is a set of bristles, more slender than the second group, but stronger than the third, and showing granulations, especially towards the tip.

The eighth foot still presents the four groups superiorly, the more robust being in front and somewhat below the dorsal cirrus. Ventrally there are four or five very strong though very brittle bristles which show an increase in the gap between the spine and the more numerous spikes beyond. The seventh foot bears dorsally a series of very long spines, and a scale but no dorsal cirrus, the eighth having neither of the former. The spines of the seventh are not barbed at the tip, but they are fully so in the ninth group.

In an average specimen the following is the arrangement of the feet in regard to cirri and bristles:—the first presents a dorsal and ventral cirrus; the third, a dorsal cirrus; in the fifth the bristles have undergone great elongation, but are without traces of barbs:

the sixth, a dorsal cirrus; the seventh, long dorsal bristles; the eighth, a cirrus; the ninth, abundantly barbed long dorsal bristles, with a few simple ones; and so on to the twenty-eighth, which has a cirrus; the twenty-ninth, a cirrus; the thirtieth, dorsal bristles; the thirty-first and thirty-second, dorsal cirri; the thirty-third, bristles; the thirty-fourth and thirty-fifth, cirri; the thirty-sixth, bristles; the thirty-seventh and thirty-eighth, cirri; the thirty-ninth, modified small bristles; the fortieth and forty-first, cirri; and the forty-second, bristles.

Thus the general arrangement in regard to the structure of the feet throughout the chief part of the body, viz., from the fifth to the twenty-eighth foot, is that the segments bear cirri and long dorsal bristles or spines (with scales) alternately, the former having the chief bristle-tufts directed laterally, the latter dorsally. A typical spine-bearing segment, *e.g.*, the nineteenth, bears dorsally a series of boldly curved dull golden bristles which sweep backward and inward over its own and the succeeding scale. These bristles are rather broad and flattened inferiorly, but taper to attenuate simple extremities, the greater part of the latter region being minutely nodulated. They seem to attain their greatest development in those species devoid of a dorsal felt, and thus probably subserve a protective function. The next inferior group consists of a tuft of lustrous brown spines (*setæ glochideæ*), about three-quarters of an inch in length, which slant backward in a conspicuous manner (Pl. IVA. fig. 5—representing an example in which the sheath at the tip has been removed). A characteristic feature when contrasted with *Lætmonice filicornis* is the opposite or nearly opposite position of the fangs, some showing them very slightly alternate at the base. There are usually five pairs of these recurved fangs, though a few show six, the first and last being smaller than the others. This formidable defensive apparatus is sheathed in two chitinous flaps (Pl. IVA. fig. 6—from the ninth foot, and somewhat broader than usually seen). As mentioned, a few in the ordinary feet show alternate fangs (Pl. IVA. fig. 7); and one or two equally powerful bristles of the same length, but with smooth tips, also occur. Below the foregoing is a tuft of simple bristles having striated shafts and very attenuate tips. With the latter exception the whole of the bristles are advanced upward, so that they alternate with neighbouring feet. In young specimens the strong spines on the dorsum are often simple at the tip, and the dorsal dull golden simple bristles stand nearly erect instead of curving over the scales as in the adult. The number and variety of parasitic growths and adherent debris on these and other bristles are remarkable, and indicate the rich nature of the ground on which they feed.

The ventral bristles (Pl. IVA. fig. 8) have lustrous brown shafts, and project far beyond the feet on each side. The shaft has a long and curved hook at its distal end, then after an interval this is followed by a series of chitinous processes (arranged in a pectinate manner), which gradually diminish in size to the slightly hooked tip. Posteriorly, the bare part at the tip again lengthens as observed anteriorly (Pl. IVA. fig. 3), and the spines diminish in length. There is thus a transition anteriorly and posteriorly. The central

portion (that which surrounds the cavity, and is streaked by transmitted light) is tougher than the exterior glistening part, and is often torn out in the form of a long appendage to the tip.

The scales amount to twenty pairs, and entirely cover the dorsum, the first and last being small. They are smooth, parchment-like, slightly iridescent organs, showing under a moderate power granular rows radiating from the attached portion. The segments to which they are fixed in an example having twenty pairs are:—second foot, fourth, fifth, seventh, ninth, eleventh, thirteenth, fifteenth, seventeenth, nineteenth, twenty-first, twenty-third, twenty-fifth, twenty-eighth, thirty-first, thirty-fourth, thirty-seventh, fortieth, forty-third, and forty-fifth. They are symmetrically arranged, as usual, on both sides. No dorsal felt exists.

The dorsal cirri are long smooth organs, tapering from base to tip, and each is furnished with the distal pear-shaped process. As usual they occur on the feet devoid of scales. The ventral cirrus is a short subulate process, with a basal division. The tip scarcely reaches the point of exit of the inferior bristles.

The anus is dorsal and well-defined. The last pair of small scales arch over it superiorly.

The ventral surface of the body has many brownish cuticular warts, which also cover the sides of the feet. Some of the younger specimens dredged off Christmas Harbour show a much more villous condition of the ventral surface, and the villi are pale. This papillose state is very conspicuous over the post-oral area.

The play of colours even in the spirit-preparations is varied. The dorsum has a pale iridescent hue from the scales, upon which the lustrous dark golden inner dorsal bristles rest. These are flanked by the boldly developed long spines, which are deep brown, while the pale golden lateral tufts form a conspicuous fringe from head to tail along their outer border. Thus from the first the long spines form a median row flanked by two golden rows of varying shades. Lastly, the long lustrous ventral bristles constitute an interrupted series of palisades below. A large number of parasitic growths—sponges, Foraminifera, Diatoms, hydroid zoophytes, Polyzoa, Loxosomæ, Ascidians, entangled worms, and others in tubes of sponge-spicules—occur amongst the bristles.

One half of the alimentary system of the animal is formed by the powerful œsophageal apparatus or proboscis, the comparatively short intestinal canal succeeding the latter having its surface augmented by lateral diverticula, which in these subserves the purpose of the spiral valve in higher forms. The intestine generally contains a quantity of greyish pulp, showing a vast number of sponge-spicula, fragments of Diatoms, bristles of Polynoidæ and other Annelids, fragments of sessile-eyed Crustacea, ova, a few small Mollusca, and all the organic debris usually found in rich mud. The proboscis is much more flattened from side to side than in *Aphrodita aculeata*, but it seems to be composed of the same densely arranged series of fibres. It differs in its relation to the alimentary

canal posteriorly, for its conical termination projects freely into the dilated digestive tube, which throughout is larger proportionally than in *Aphrodita aculeata*, and does not exhibit the siphonal bend at the termination of the proboscis. The papillæ of the cuticle are less globular than in *Aphrodita aculeata*, having a somewhat ovoid shape.

This species evidently occurs, as many of its congeners do elsewhere, in great profusion at Kerguelen. It is briefly described by Prof. Grube[1] from specimens procured by the German exploring ship "Gazelle." It was the only species of the genus got in the Expedition. Although perhaps not a typical representative of the group, it shows how insecure the notion of Kinberg and De Quatrefages was, that *Lætmonice* diverges from *Hermione* in having the dorsal covering of felt over the scales. This has been dwelt on by Baird, Grube, and Claparède.

Lætmonice producta, var. *wyvillei* (Pl. VII. fig. 3; Pl. IVA. figs. 9–11).

Habitat.—Dredged along with many other Annelids on very rich ground at Station 144A off Marion Island, December 26, 1873; lat. 46° 48′ S., long. 37° 49′ W.; in 50 to 70 fathoms; surface temperature, 41°·0; volcanic sand. Another Station is off Prince Edward Island, in 150 fathoms; and a third is Station 157 (about midway between the Antarctic regions and Australia), on March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E; depth, 1950 fathoms; surface temperature, 37°·2; Diatom ooze. The latter Station was also prolific in novelties.

This form on careful examination differs from the foregoing, even in external appearance. Thus the colour of the long dorsal bristles is much darker and duller than in the typical *Lætmonice producta*, and they also have less "sheen." The ventral surface is more villous or papillose, especially over the oral region. The head has somewhat shorter and more globular ocular peduncles, which, however, show no trace of eyes. The median tentacle is considerably longer, though it follows the same type. The process behind the ocular peduncle on each side is simple and much smaller. The length of the largest example is about 68 mm., and its breadth 25 mm., exclusive of the bristles. The number of segments is forty-three.

The great dark brown spines of the dorsum, traces of which occur on the fourth foot, quite differ from those of *Lætmonice producta*. They are rather stouter, especially at the tip (Pl. IVA. fig. 9), and as a rule there are only three recurved fangs on each side, rarely four. The differences in general structure are shown by contrasting the figure just mentioned and fig. 5 of the same plate. The recurved teeth are directed more to one face than another, so that both are not well seen at the same time. Another divergence is the length of the inner dorsal bristles, which in the previous species form the conspicuous series over the scales. In *Lætmonice producta*, var. *wyvillei*, they are longer, and

[1] *Monatsber. d. k. preuss. Akad. d. Wiss. Berlin*, August 1877.

their curve at the tip less marked. The minute nodes toward their distal region are also larger and more evident (Pl. IVA. fig. 11), while the tip is smooth.

The semipennate ventral bristles (Pl. IVA. fig. 10) are distinguished from those of the previous species in being furnished with much more slender and elongated tips, but the terminal part or hook is shorter. The secondary processes or pinnæ are more numerous, more slender, and more elongated. Moreover, throughout the lower two thirds it is observed that these show a slight enlargement toward the centre, so that the process is somewhat fusiform. Instead of the comparatively small number of these pinnæ in the typical *Lætmonice producta*, there are upwards of seventy in the present form. The basal hook is proportionally smaller, and it is often broken; indeed the entire bristle is very easily injured, so that it is rare to have the pinnæ perfect. Parasitic on the bristles were many beautiful thecate Infusoria with Diatoms in their interior, and stalked *Acineta*-forms externally; and to one bristle a small *Terebratula* adhered. Foraminifera and Diatoms occurred in swarms on these organs.

Only eighteen scales appear to be present; otherwise there is complete similarity between this form and the foregoing, in regard to both scales and cirri. The number of the scales is, however, of comparatively little moment; the main distinction lies in the structure of the dorsal spines and ventral bristles. It is an interesting feature also that the long lateral bristles of the cirriferous feet have a nodular surface towards the tip, and that the head differs in form as well as in the absence of eyes. The papillæ of the cuticle are ovoid. This appears to be a well marked variety of the foregoing.

The example from 1950 fathoms had evidently fed on one of the Polynoidæ allied to *Evarne*, and its intestinal canal contained shreds of skin, hosts of bristles, pieces of scales, numerous Radiolaria, and much granular debris.

Lætmonice producta, var. *benthaliana* (Pl. VIII. figs. 4, 5; Pl. IVA. fig. 12; Pl. VA. figs. 1, 2).

Habitat.—The geographical range of this form is considerable. It occurred in the trawl, along with a huge *Balanoglossus* from Station 147 (between Prince Edward Island and Kerguelen), December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms; bottom temperature 34°·2, surface temperature 41°·0; Diatom ooze. Again in the trawl at Station 157 (midway between the Antarctic regions and Australia), March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; bottom temperature 32°·1, surface temperature 37°·2; Diatom ooze. Along with it were a remarkable villous *Trophonia*, a rare Ascidian, and a Holothurian. It was also trawled at Station 241 (in the North Pacific), June 23, 1875; lat 35° 41′ N., long. 157° 42′ E.; depth, 2300 fathoms; bottom temperature 35°·1, surface temperature 69°·2; red clay. Lastly at Station 244, June 28, 1875; lat. 35° 22′ N., long. 169° 53′ E.; depth, 2900 fathoms;

bottom temperature 35°·3, surface temperature 70°·5; red clay. Most of the specimens were loaded with mud or ooze of varying character, according to the nature of the ground, and it adhered most tenaciously to the bristles.

There is little in external appearance to distinguish it from its congeners except perhaps the very great length of the dorsal spines, the greater delicacy of the scales, the greyish muddy coating of the bristles, and the smoothness of the ventral surface. The latter presents only a few minute papillæ, which are somewhat conical in shape, and a few also occur in the middle of the dorsum. The length of a large example is about 48 mm. The number of segments is about thirty-three.

The head is somewhat smaller than in either of the foregoing, and the attachment of the first pair of scales infringes considerably on its area posteriorly, in contrast with those alluded to. The ocular peduncles are more globular, and they are eyeless. The median tentacle is a similar elongated tapering structure with the peculiar enlargement at the tip. The papilla in a line behind the ocular peduncle is much less developed than in either of the foregoing, forming a barely appreciable eminence just in front of the attachment of the first scale. The lateral regions of the head are very prominent. The palpi are somewhat longer than in *Lætmonice producta*, var. *wyvillei*, but show the same microscopic cuticular papillæ. Between their bases is a papillose wedge, the papillæ being much less developed inferiorly than in the last-mentioned form. Behind the oral region ventrally is the usual longitudinally grooved area, which, however, has only small papillæ at the sides; indeed, the whole ventral surface is in contrast with that of either of the former species, for it is smooth and glistening, under the naked eye, the lens, and the microscope.

It is unnecessary to go into the arrangement of the scales on the different feet, since they follow the same rule as in the previous forms. Their number is generally fifteen pairs; and they are also more delicate and diaphanous, exhibiting under the microscope a finely granular condition with radiating lines.

The dorsal bristles (forming the great spines) are considerably larger than in the preceding, and while their shafts are large and flattened, the tips are relatively small (Pl. Va. fig. 1), and, as represented in the drawing, present a distinct curve in certain views. They are grooved at the base and have a peculiar reddish-brown sheen. The number of recurved hooks at the tip varies, but the average is three or four. One showed the peculiarity of having a series of small teeth on each side below the larger. The simple bristles as a rule have minute spikes directed downward toward the terminal region, a condition less marked in the previous forms, though the amount of adventitious structures often obscures their minute characters. The granulations are probably modifications of this feature. One of the hairs from the dorsal tuft overlapping the scales is represented in Pl. IVa. fig. 12. The longitudinal striæ are very distinctly marked in these bristles,

and as the recurved spikes are only seen on one side in relief, it is probable that they do not entirely surround the bristle. The shaft likewise shows numerous chitinous prickles. Viewed as a whole, the bristle is somewhat fusiform, narrow at tip and base, and dilated in the middle.

The ventral bristles (Pl. Va. fig. 2) have a brownish colour. The shaft slightly dilates upward toward the spur, from which it diminishes to the tip. The latter is strongly hooked, and the inward curve of the dorsal edge of the region below is much more pronounced than in *Lætmonice producta*, var. *wyvillei*. The setæ or pinnæ of the tip gradually increase in length from base to apex, the lowest series being shorter and stouter than in the last-mentioned variety; but the spur is similar.

The arrangement of the cirri seems to be the same as in the two previous forms. The two cirri on the first foot are shorter than the succeeding, but all are very delicate and tapering, much more so than in either of the foregoing. Nothing is more diagnostic than the condition of the ventral cirrus, which forms a very minute filiform process about the middle of the greatly elongated foot. It can barely be detected with the naked eye.

The anus forms a prominent button projecting upward in the middle line at the posterior extremity. It is covered by the last pair of scales. In a specimen from Station 147 the intestine was loaded with greyish mud composed of sponge-spicules, Radiolarians, Foraminifera, Diatoms, &c.

The specimen from Station 157 has eighteen pairs of scales, but so far as can be noticed the great dorsal bristles nearly agree with the description, while the ventral mainly differ in regard to the greater number of short stiff ones near the lower edge. There are slight differences in regard to the head. Those from Station 244 are much softened and injured. The great spines of the dorsum generally show three recurved fangs on one side and four on the other, and the shaft is covered with prickles. The largest example has a parasitic hydrozoon growing under the scales on its dorsum, with a soft cœnosarc and peculiar saccate hydranths, which Prof. Allman finds is a new type. The ventral bristles of these deep-sea forms are hollow, and become quite flattened by desiccation. The extraordinary quantity of Diatoms, stalked Infusoria, spicules of sponges, and *Synaptæ* entangled in the mucus amongst the bristles is a striking feature.

In this form the nerve-cords seem to be much diminished, only a slight thickening in the central region of the long area marking their situation in transverse section.

Lætmonice producta, var. *willemoesi* (Pl. VI. fig. 3; Pl. Va. figs. 3, 4).

Habitat.—This form has a very wide range, extending from the Azores to the Antarctic Ocean and the north-eastern shores of Australia and New Zealand. It was obtained in the trawl at the following localities, every one of which had a sea-bottom of Globigerina ooze:—Station 70 (to the west of the Azores), June 26, 1873; lat. 38° 25′ N.,

long. 35° 50′ W.; depth, 1675 fathoms; surface temperature, 70°·0; Globigerina ooze. Station 133 (near Tristan da Cunha, in the middle of the South Atlantic), October 11, 1873; lat. 35° 41′ S., long. 20° 55′ W.; depth, 1900 fathoms; bottom temperature 35°·4, surface temperature 58°·0; Globigerina ooze. Station 146 (to the east of Prince Edward Island), December 29, 1873; lat. 46° 46′ S., long. 45° 31′ E.; depth, 1375 fathoms; bottom temperature 35°·6, surface temperature 43°·0; Globigerina ooze. Station 169 (off the north-east point of the northern island of New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; Globigerina ooze. Station 184 (off the north-eastern shores of Australia), August 29, 1874; lat. 12° 8′ S., long. 145° 10′ E.; depth, 1400 fathoms; bottom temperature 36°·0, surface temperature 77°·5; Globigerina ooze.

This species closely approaches *Lætmonice producta*, var. *benthaliana* in external appearance, except that minute brownish papillæ on the scales render the dorsum somewhat dusky, and that the palpi are much longer. The number of segments is about thirty-five; the length of one of the larger examples is 33 mm., and the breadth (exclusive of bristles) 13 mm.

The head differs from the preceding in having large ocular peduncles, which are quite globular. The distinction is evident when two specimens of equal size are placed together. The ocular peduncles, indeed, are so large that the median tentacle is thrust backward, whereas in the former it lies between the peduncles. In the north Australian example the ocular peduncles are somewhat smaller and more distinctly separated from the tentacle. The peduncles in all are devoid of pigment. The median tentacle and all the cirri are decidedly longer. The palpi also exceed very considerably those of *Lætmonice producta*, var. *benthaliana* in length, show both a dorsal and a ventral ridge in the preparation, and have their surface covered with cuticular papillæ. There is no visible papilla behind the ocular peduncles. The palpi have a similar (triangular) papillose mass between their bases, and the oral margins of the ventral eminence are papillose. Small papillæ occur on the cuticle of the ventral surface.

The extruded proboscis extends outwards nearly three fourths the length of the animal. It is terminated dorsally and ventrally by a densely papillose fringe, and the inner surface is produced above and below into firm almost cartilage-like protuberances. The villous condition is due to an immense number of papillæ arising from isolated processes. The papillæ are simple, bifid, or multifid structures, and show at least two rows of cells. The basal region of the papillæ is peculiarly wrinkled.

The scales are fifteen pairs, and differ from those of *Lætmonice producta*, var. *benthaliana*, in showing a few minute brownish papillæ on the dorsal surface. The latter are absent in one example, viz., that from Station 70.

Unfortunately the dorsal spines had almost disappeared. Only a single short (developing) spine occurred at the posterior third of one specimen. It resembles that of the previous form, having four teeth on one side and three on the other (Pl. Va. fig. 3). Its colour is somewhat lighter than in *Lætmonice producta*, var. *benthaliana*, being of a golden brown. The shaft, as in the latter, possesses many prickles. In a specimen from the north-east coast of New Zealand the dorsal spines showed three teeth on each side.

The ventral bristles are also much broken, and they differ from those of *Lætmonice producta*, var. *benthaliana* in being somewhat more slender, and in having the pinnæ next the hook (Pl. Va. fig. 4) much more elongated. Only one or two of the inferior pinnæ are slightly thickened. These pinnæ are also proportionally longer, especially towards the tip, than those of *Lætmonice producta*, var. *wyvillei*. The transverse striæ in the shaft are very closely arranged, and appear to be more regular and distinct than in any of the former. In some of the larger examples the posterior edge of the tip shows minute roughnesses. Occasionally the spur is bifid. The shafts also appear to be angular, especially in mounted preparations.

The dorsal cirri are somewhat longer than in *Lætmonice producta*, var. *wyvillei*, but the ventral are similar. The foot is also more gibbous at the base.

The siphonic curve of the alimentary region behind the proboscis is well marked in the specimens. The intestine contained greyish mud composed of Foraminifera, fragments of minute Crustacea, perforated calcareous plates like those of the Polyzoa, sponge-spicules, and debris.

It is very interesting to notice the closeness with which the three forms, viz., this, the var. *benthaliana* and the var. *wyvillei* approach each other; yet, after careful consideration, it is no easy matter to unite them. The differences in external appearance, in the cephalic appendages, and in the structure of the bristles which characterise each, are so well defined that, with the evidence at command, separation might have been pardonable, but it has been thought prudent at present simply to make them varieties of the typical form. The difference in size of the respective forms is also noteworthy.

Lætmonice producta, var. *assimilis* (Pl. VIII. fig. 2; Pl. Va. figs. 5–8).

Dredged at Station 49 (south of Halifax, Nova Scotia), May 20, 1873; lat. 43° 3′ N., long. 63° 39′ W.; depth, 85 fathoms; bottom temperature 35°·0, surface 40°·5; gravel and stones. The fauna of this region very much resembled that of the mouth of the river St. Lawrence, Canada.

This form closely approaches several of its congeners, but shows certain differences which merit special notice. The length is about 35 mm. and its breadth (exclusive of the bristles) 15 mm. The segments are about thirty-five.

The head agrees for the most part with that of *Lætmonice producta*, var. *willemoesi*, and the tentacle differs from the Zetlandic form[1] in its greater length. The ocular peduncles are fairly developed and rounded. The scales amount to fifteen pairs.

The dorsal setæ (Pl. Va. fig. 5) show three recurved fangs on one side and four on the other, sometimes four on both, and differ from the Zetlandic species in being less flattened in the shaft, less rapidly diminished at the tip, and in being differently curved; moreover, their shafts are devoid of the prickles usually seen thereon. In contrasting the tip of the Zetlandic form (Pl. Va. fig. 7) with this (Pl. Va. fig. 6), the rapid and great diminution is very apparent. The latter depends to some extent on the larger flattened shaft of the British representative.

The ventral bristles (Pl. Va. fig. 8) again diverge from any of the others (and especially from the British form) in having the pinnæ of the tip prolonged downward so as to touch in many cases the origin of the spur at the end of the shaft. There is usually a very clear interval in allied forms. Moreover, there is not much difference between the pinnæ at the tip and those next the spur. The latter is also very acute. The terminal hook is more decided than in the previous varieties.

The intestinal canal in most was empty, but in one a brownish granular membranous mass like a shred of a *Salpa* or other gelatinous invertebrate was present.

The ventral surface has a somewhat numerous series of ovoid papillæ. The nerve-area is indistinct in the preparation, and in the deep-sea forms seems to be more or less atrophied.

Lætmonice japonica, n. sp. (Pl. VIII. fig. 1; Pl. IVa. fig. 13; Pl. Va. figs. 9, 10).

Dredged at Station 232 (south of Japan), May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature 41°·1, surface 64°·2; green mud.

The single example is about 30 mm. in length and 13 mm. in breadth. The number of segments is thirty-six.

The dorsum is wholly covered with a coat of felt much impregnated with sand, which also invests the hairs on the sides. The pale, smooth scales are thus completely hidden.

The head is broad and rounded in front, narrow behind, and with a pit on each side of the nuchal ridge posteriorly. The base of the tentacle alone remains. The ocular peduncles are large and globular, and though no eyes are visible, a slight ring is present on the anterior convexity of the peduncle.

Such of the great dorsal spines as remain are of a dull brownish hue with the usual iridescence. The shaft is considerably flattened, and has very distinct prickles thinly scattered over it, while the tip gently tapers (thus differing from the Zetlandic form) to a point, which usually has two recurved fangs on each side (Pl. Va. fig. 10). A few show

[1] *Lætmonice filicornis*, Kbg.

three on each side, or three on one and two on the other. The teeth are comparatively large, and stand prominently out from the stem. The shaft has numerous minute nodules on its surface (Pl. IVA. fig. 13, representing a portion a short distance below the inferior end of Pl. VA. fig. 10), and they are always seen on the side corresponding with the concavity at the tip.

The ventral bristles (Pl. VA. fig. 9) are quite uniform throughout, and consist of an angular and brittle shaft, and a tip with somewhat long pinnæ. No spur was observed, and no trace of such ever having been present. There is no enlargement at the bases of the pinnæ, and the latter at the tip are only a little more slender than those further down.

The ventral surface is smooth to the naked eye, but when examined microscopically shows a few somewhat clavate papillæ, larger than in var. *willemoesi* and the rest, and the cirri and other parts are similar to those in its allies. The dorsal felt is somewhat friable and soft, and presents the usual elongated hairs enveloped in gelatinous material loaded with sand-grains. The intestinal canal contained fragments of an Amphipod.

Prof. Grube describes[1] a species (*Lætmonice violascens*) from the China Sea having a dorsal coat of felt, purplish scales, and dorsal spines with four recurved fangs. The description, however, is not sufficiently minute to render identification possible.

Lætmonice aphroditoides, n. sp. (Pl. VII. figs. 4, 5; Pl. VA. figs. 11–15).

Trawled at Station 235 (somewhat to the south of Yedo, Japan), June 4, 1875; lat. 34° 7′ N., long. 138° 0′ E.; depth, 565 fathoms; bottom temperature 38°·1, surface 73°·0; green mud.

The length of the single example is 25 mm., and its greatest breadth (exclusive of bristles) is about 16 mm.

The outline of the body is rather broadly ovoid, and the posterior end is peculiarly attenuated, and since there is no trace of reproduction having occurred this would seem to be normal. The number of segments is thirty-nine. To the naked eye the dorsal covering (which entirely conceals the scales) appears to be composed of mucilaginous substance and sand. Microscopically, however, this layer is made up of a vast series of fine hairs with similar hooked tips to those of *Aphrodita*, though taking the field as a whole they are much more slender. The entire area is covered by a nearly uniform mass of these fine fibres, whereas in *Aphrodita aculeata*, of the same size, there are many fibres of much larger diameter amongst the others. The terminal hooks of the fibres in this species (Pl. VA. fig. 11) do not appear to offer anything diagnostic. The ventral surface is covered with numerous minute globular papillæ, and the cuticle is so transparent that the ganglia and nerve-cords are visible in the middle line. The head differs

[1] *Sitzungsb. d. naturwiss. der schlesischen Gesellsch.*, May 13 and December 2, 1874.

from that of any known form. It is prominent and rounded, having anteriorly a little conical papilla in place of a median tentacle. On each side is a rather small ocular peduncle without a trace of pigment. The fimbriated prefrontal lobe of the others is here represented by a smooth tongue-shaped process, which from its concavity superiorly is spoon-like. Posteriorly is a very deep pit on each side of the nuchal bridge of the head. Moreover, after removal of the first scale a somewhat triangular thin lamella (with the point in front) projects forward beyond the ocular peduncles and partly shades the side of the head. The palpi are about the length of those in the British species. The tentacular cirri are absent, but the dorsal show a decided difference in regard to the general contour. The organ is somewhat shorter proportionally than in *Lætmonice filicornis*, and tapers more distinctly below the tip, so that the latter forms an elongated ovoid nearly twice the diameter of the neck below. In *Lætmonice filicornis* the neck is somewhat thicker than the commencement of the tip. As Claparède truly remarks,[1] these organs are well fitted for showing the terminations of the nerves. The ventral cirrus resembles that in the previous forms, being subulate and short. Posteriorly, however, it becomes elongated.

The great dorsal spines form a conspicuous fringe to the sides of the body. They have a lustrous brown colour, and are considerably shorter and broader than in *Lætmonice filicornis*. Their points, moreover, are simple throughout (Pl. Va. fig. 12). The ventral bristles, again (Pl. Va. fig. 13), lean towards the structure seen in *Aphrodita*, and it is easy to conceive the passage from the densely spinous ventral tips of such as *Lætmonice japonica* to the hairy condition of this species. Those of the first eight or nine anterior feet differ from the succeeding in having a series of minute serrate bristles (Pl. Va. fig. 14), along with one or more stout brownish spines (Pl. Va. fig. 15.) A series of intermediate forms between the one and the other generally occur in each foot, some of the smooth forms having the shape of a dart with a finely tapered point. Towards the posterior end of the body the serrate kind also occurs, but the tips are extremely elongated in the posterior feet. Some of those with the dart-like smooth tips are curiously wrinkled. All these features clearly agree with the morphology and relations of the several forms above mentioned.

The species at first sight resembles a *Lætmonice*, but the absence of the long median cephalic and the lateral tentacles is diagnostic. The long palpi, however, still remain. To the naked eye the dorsal and ventral bristles and their arrangement appears to be similar, only the former are less covered with mud than usual. On the other hand, it quite differs from *Aphrodita* in the absence of the iridescent hairs composing the felt, in the characters of the dorsal spines, and in the flattened form of the body, which in outline, however, more nearly resembles *Aphrodita* than *Lætmonice*. The specimen is too pulpy for satisfactory section.

[1] Annél. Chétop., p. 57.

Family Palmyridæ.

Palmyra, Savigny.

Palmyra aurifera, Savigny? (Pl. IX. figs. 1, 2; Pl. VIA. figs. 8, 9).

Dredged at Station 233A (near Kobé, Japan), May 19, 1875; lat. 34° 38′ N., long. 135° 1′ E.; depth, 50 fathoms; surface temperature, 62°·6; sand.

The single specimen is about 12 mm. in length and 4 mm. in breadth, and the body is slightly tapered at each end. The feet amount to thirty-three pairs.

The head is small, and covered by the anterior dorsal spines as well as the first pair of scales, so that its structure is only observed on raising the latter. The eyes are two, large and black, situated on a peduncle on each side, after the manner of *Lætmonice*. The median tentacle is absent, but in the bottle a slender process with a bulbous tip, to which is attached a short distal piece like those of the cirri, occurs, and is probably the organ in question. From the front of the head spring two long palpi, which taper to a tolerably fine point. Their surface is covered from base to tip with numerous long acicular papillæ.

The dorsal surface of the body is slightly convex at the sides, depressed in the middle, and furnished with the golden spines. The ventral is flattened and papillose, the smooth regions of the ventral longitudinal muscles contrasting with the segmented centre and sides.

The first foot is directed forward, and bears the usual tentacular cirri, the dorsal being the longer. This organ (to take the latter for an example) springs from a large basal segment as a somewhat slender process, which gradually dilates, and narrows again so as to assume a fusiform appearance. Finally it is continued as an elongated, slender, distal region, of a somewhat clavate form, the terminal part having the cuticle so thin as to appear (especially by transmitted light) differentiated from the rest. Such an appearance, however, is deceptive, since the organ is continuous from the tip of the basal region to the distal extremity. The dilated fusiform portion has a few short clavate papillæ, some of which are slightly bifid. The commencement of the slender distal region beyond is marked by a few wrinkles. The globular papillæ of the first foot are mounted on long pedicles, and the bristles are for the most part smooth.

The dorsal division of the fully developed foot carries the remarkable spinose bristles with the conspicuous golden lustre. In front they are shorter and broader, and, indeed, they gradually lengthen towards the posterior extremity. Each of these bristles (Pl. VIA. fig. 8) consists of a more slender basal region or shaft, mostly hidden in the dorsum, and a prominently serrated and larger distal division. The latter is clearly homologous with the shorter (distal) serrated region in Claparède's *Pontogenia*,[1] and, moreover, corresponds to the spinose part in the dorsal bristles in the Polynoidæ, though

[1] Annél. Chétop., p. 57.

in *Palmyra* it assumes the form of a transverse collar or scale, forming a double row. The entire bristle is curved on itself, and it is difficult to see one on the flat. They are by no means brittle, but on the contrary resist a considerable strain without fracture. Immediately beneath the foregoing great bristles are a series of fine, elongated hair-like bristles, with an extremely attenuate tip, which is marked with minute roughnesses or points, so that foreign matters of all kinds adhere. The same series occurs in *Pontogenia*. The ventral bristles (Pl. VIA. fig. 9) are stout and somewhat fragile. They rather increase in size than diminish from below upward toward the bifid tip, which is terminated by a simple, slightly bent hook, with a short, strong spur at the base.

The dorsal cirri occur both on feet provided with scales and on those without them; the former arrangement having been seen in front, the latter in certain of the posterior segments; but the specimen is not in a fit state to show the precise condition in regard to the serial arrangement. These have the same shape as the tentacular cirri, only they become more slender and elongated posteriorly. The ventral cirrus is short, but it has the same distal process (the so-called "articulation") as the dorsal. A careful consideration of the appearances presented by the cirri shows that Savigny's original description of the organs in *Palmyra aurifera* would equally suit the foregoing. They are "grêles, cylindriques, terminés, par un petit filet également cylindrique et renflé au bout." The figures and description of Savigny's form by Audouin and Milne-Edwards bear out this view. Moreover, the whole structure of the organs (as given under the tentacular cirri) so closely resembles the same parts in Claparède's new genus *Pontogenia* that it may be doubted whether much reliance can be placed on the so-called quadriarticulate tentacle. The latter would be very exceptional in the group, while the interpretation given above would be in accordance with that characteristic of the family and its allies.

The first pair of scales are borne on the third foot, and the fourth is also elytrophorous. The succeeding scales seem to be mostly alternate. No trace of a scale occurred on the first foot (which is turned forwards) in the specimen. The first scale is smooth, shining, and diaphanous; and beyond a series of parallel streaks and a firm border shows nothing noteworthy in structure. Their number would seem to be about fifteen, and they cover the back completely.

In the structure of its body-wall this species is Aphroditacean. It possesses a similar proboscis and muscular system, and its dense cuticle on the ventral and lateral regions is thickly covered with the pedicled globular papillæ. Moreover, the disposition of the nerve-cords nearly approaches *Aphrodita*, though they are proportionally larger, and the area in which they lie is narrower, the oblique muscles, indeed, touching the cords at their insertion.

Savigny[1] in 1820 established the genus *Palmyra* as one of his Aphroditaceans,

[1] Syst. des Annél., p. 16.

characterised by a mouth with the proboscis devoid of tentacles; head with two distinct eyes, antennæ complete, the middle very small and conical, the intermediate similar and a little longer, the exterior large. Feet of two separate divisions, the dorsal with two unequal fasciculi of bristles inclined backward, the ventral with a single bundle of forked bristles. The dorsal and ventral cirri slender, cylindrical, terminated by a little cylindrical process enlarged at the tip. The dorsal cirri are inserted behind the base of the inferior fascicle of dorsal bristles. The first pair of feet furnished with bristles; and the last almost like the others. The branchiæ indistinct, ceasing to appear alternately on each segment after the twenty-fifth pair of feet. No elytra. Head depressed, a little raised behind the antennæ. Body oblong, depressed, composed of a number of segments. His only species (the *Nereis palmifera* of the Cuvierian collection) had been collected at the Isle of France by M. Mathieu. Savigny in his original description noticed both kinds of dorsal bristles, and as his specimen had thirty feet, he hazarded the opinion that if scales had been developed they would have been fourteen in number. His countrymen, Audouin and Milne-Edwards,[1] in 1834 made *Palmyra* the third tribe of their *Aphrodisiens*, characterised by the absence of elytra (*Aphrodisiens nus*). Nothing was added to Savigny's description save a few indifferent figures, some of which afterwards appeared in the Règne Animal. Grube[2] in 1855 added another species to the family. It had four eyes and very different ventral bristles. Moreover, in his recent Annulata Semperiana,[3] he revises the description of the family, and gives a notice of Savigny's species (*Palmyra aurifera*). No scales are stated to exist. Claparède[4] in 1862 also referred generally to the group in his description of two new forms (very different from the foregoing) from the Mediterranean; and again in 1868[5] he alludes to the subject in regard to *Chrysopetalum* in which scales are likewise absent. Schmarda[6] gives Kinberg's definition of the family, viz., elytra absent, paleæ on every segment; tubercles and dorsal cirri alternate. The genera, *Paleanotus* and *Bhawania*, described are likewise quite different from *Palmyra*. Ehlers, in his comprehensive general remarks on the literature of the subject at the end of his description of *Chrysopetalum fragile*[7] gives no information on this important subject of the scales, which he believes do not exist. De Quatrefages,[8] again, in his account of the genus *Palmyra*, deprives it of eyes as well as scales, and erroneously gives it three tentacular cirri instead of two.

The original specimen (of *Palmyra aurifera*) described by Savigny seems to have been the only one examined, up to the date of Grube's Annulata Œrstediana, and from the close similarity of *Palmyra* in regard to the structure of the head, the structure of the feet, the form of the bristles, the pinnate condition of the alimentary canal, and other points, it is hardly in accordance with what is known in allied forms that scales should

[1] Hist. nat des Annél., p. 110, pl. iia. figs. 1–6.
[2] Annulata Œrstediana, p. 25.
[3] Annél. Fauna d. Philippinen, p. 12.
[4] Glanures Zootomiques, &c., p. 123.
[5] Annél. Chétop., p. 107.
[6] Neue wirbell. Thiere, I. ii. p. 162.
[7] Die Borstenwürmer, i. pp. 88–92.
[8] Annelés, i. p. 292.

be totally absent. There is a possibility that they may have been removed or overlooked. At all events further and more precise observations are necessary before their entire absence can be held to be proved. The possibility of scales being present in *Palmyra* gives a different aspect to Risso's[1] description of *Eumolphe fragilis*, a species he found under stones on the shores of the Mediterranean; and the same may be said of Claparède's genus *Pontogenia*[2] from Naples.

Family Polynoidæ.

This family is represented in the Challenger collection by a very large number of species, and a few of these by many examples. Thus while in the important work of Kinberg on those procured during the voyage of the Swedish frigate "Eugenie," thirty, including the Iphionidæ, are described, and Grube's Philippine forms collected by Semper amount to eighteen, those of the Challenger reach to about fifty.

In discriminating the species, little reliance (and in this De Quatrefages agrees) has been placed on the number either of the segments or on that of the scales, within certain limits. The position of the antennæ and tentacles and the general structure of the head in many cases is more satisfactory. Moreover, though Claparède thought that it was wrong to place too great weight on the bifid or simple condition of the bristles, there cannot be a doubt that the minute structure of both dorsal and ventral bristles is absolutely essential in any efficient diagnosis. Some authors, such as Grube, give a drawing of a scale and no other part of a species, but it is well to remember that in many cases scales are absent, and that it has never been proved that the characters afforded by the bristles are unreliable. Bristles alone, it is true, do not suffice to establish genera, but it is worthy of note that they carry with them important corresponding characters in other parts. To say that the bristles of the same foot are bifid and simple, and hence belong to different genera, conveys little information. There are many different kinds of bifid bristles, just as there are many varieties of simple bristles. It is only by a careful study of external configuration, head, scales, bristles, and other parts, that forms so closely allied, yet so distinctly (if delicately) separated, can be thoroughly elucidated. It is often a laborious, and sometimes a hopeless task to discriminate closely allied forms by description alone. A single accurate figure would put the question at rest. Thus it is very difficult to come to definite conclusions with regard to most of the Annelids described by Grube in his Annulata Œrstediana, and so with many given by De Quatrefages; and the expenditure of time is often greater in such cases than is warrantable, for the authors had not closely allied forms in view when making their brief and often superficial descriptions. It is surprising to find such recent and excellent

[1] Hist. Nat., &c., iv. (1826) p. 415.

[2] *Op. cit.*, p. 57.

publications as those of Dr. Hansen on the Annelids of the Norwegian North Sea Expedition so lax in diagnosis and so indifferent to the value of the minute structure of the bristles. It is no argument to say that the bristles vary in each foot, and that the anterior differ from the posterior. Their variation in these parts respectively follows regular and definite laws, which, however, are very difficult of explanation, though their condition is palpable enough to every minute observer. In comparing species, each series of bristles from the same foot must of course be contrasted, and with a little care an average one in each case can readily be selected, without laboriously examining the whole. Every well-marked species has a character of its own. In order to exemplify the laxity in such descriptions it is sufficient to quote Dr. Hansen's account of the feet in his *Polynoë foraminifera*, n. sp. "The pedal protuberances with two short lobes; the ventral cirrus not reaching to the summit of the protuberance. The bristles normal in form, the dorsal shorter than the ventral, which a little below the simple arcuate point are much more coarsely transverse-serrate than the former." Familiarity with the Polynoidæ is of little avail to the reader of these lines. Dr. Hansen's figures, however, are of value in a critical revision.

In the general structure of the group considerable advances have been made in connection with the segmental organs and ventral papillæ. The authors who first called attention to the subject were Grube and Claparède, while Huxley also associated the papilla with the reproductive functions. Recently Mr. W. A. Haswell,[1] B.Sc. Edin., carefully examined the structure of the parts in Australian Polynoidæ, and pointed out the true position of the segmental organs, which open externally by the ventral papillæ, through which he also saw spermatozoa issuing in one example, and he does not doubt that the ova issue by the same channel, and are directed by the currents of cilia to the cavities under the elytra where they undergo the earlier stages of development. He did not observe any apertures in the walls of the feet in the species examined. Mr. A. G. Bourne,[2] B.Sc. Lond., subsequently described the same parts, giving a minute account of their structure, illustrated by excellent figures. He is of opinion that the segmental organs open by a trumpet-like internal termination close to the ventral longitudinal muscles, and externally by the ventral papilla. Further, he thinks the generative products do not pass out by the latter aperture, but probably by spontaneous rupture of the body-wall. In connection with the external aperture, Grube[3] pointed out the occurrence of the remarkable ventral lamellæ of *Gastrolepidia clavigera* on the site of the swelling at the base of the papilla.

The occurrence of the pseudobranchial process on the dorsum of the foot in *Achloë*

[1] *Proc. Linn. Soc. N. S. Wales*, vol. vii. pp. 262 *et seq.* Mr. Haswell was good enough to send me some very beautiful sections of these parts, and they bear out his descriptions.

[2] *Trans. Linn. Soc. Lond.* (Zool.), ser. 2, vol. ii. pp. 352–354. Dr. Marenzeller, amongst others, had anticipated Mr. Bourne in regard to the identity of *Lepidonotus clava*, Mont., with *Polynoë grubiana*, Claparède.

[3] Annel. Fauna d. Philippinen, p. 43.

astericola, Delle Chiaje vitiates M. de Quatrefages' diagnosis between the Acoetidæ on the one hand and *Polynoë* and *Lepidonotus* on the other.

It is curious that no example of *Harmothoë imbricata* has appeared in the collection, yet Marenzeller mentions it from Southern Japan, and Grube describes it from Sitcha and the Sea of Ochotsk in Middendorf's Reise. I also agree with Ehlers and others in thinking that there are not sufficient grounds for the view of Möbius[1] that this common form includes as mere varieties *Evarne impar*, Johnst., *Lænilla glabra*, Mgrn., *Antinoë sarsi*, Kinberg, and others. Such an opinion could only arise from an imperfect examination, and with limited means of observation. It is sufficient at present to allude to the identity of the minute structure of both dorsal and ventral bristles in the males and females of such as *Polynoë magnipalpa*. Möbius has been followed to some extent by Tauber[2] and Levinsen[3] in the classification of the Polynoidæ, especially the former, who adds *Lænilla mollis*, *Lænilla alba*, and *Lagisca propinqua* as varieties of *Harmothoë imbricata*. He has, however, already been corrected by Dr. Hansen.[4] The classification of G. Levinsen will be referred to elsewhere.

Iphionella, n. gen.

Iphionella cimex, De Quatrefages (Pl. IX. figs. 4–6; Pl. XVII. fig. 3; Pl. VIIIA. figs. 7, 8).

Iphione cimex, De Quatrefages, Annelés, i. p. 270.

Habitat.—Dredged at Station 214 (a little south of Mindanao, one of the Philippine Islands), February 10, 1875; lat. 4° 33′ N., long. 127° 6′ E.; depth, 500 fathoms; bottom temperature 41°·8, surface temperature 80°·5; blue mud.

At first sight, and judging only from the description of Kinberg and De Quatrefages, no definite distinction could be made out, but a critical investigation after the method used in previous examinations brought out the salient points. It is a somewhat hard form, possessing the appearance of certain Chitons, and its scales have a light yellow colour and a smoother aspect than those of *Iphione muricata*. Moreover, the outline is more ovate. The length of the single example is 13 mm., and the total breadth is 9 mm. It is therefore somewhat less than the specimen described by De Quatrefages.

The body is rounded dorsally, and somewhat flattened ventrally. Along the dorsal arch, after removal of the scales, is a double row of small tubercles or short papillæ.

The head diverges even more than in *Iphione muricata* from that of the Polynoidæ, for instead of the hollow which occupies the site of the base of the tentacle in Savigny's

[1] Exped. auf Pommerania, &c., p. 111.
[2] Annulata Danica, p. 80.
[3] Nordiske Annulata, &c., 1883, pp. 27–39.
[4] Den Norske Nordhavs-Exped., p. 2.

form, there is here a wide area, which probably represents a further stage of the divergence from the common type. Instead of the fairly formed head of *Iphione muricata*, it is difficult to say which is the essential cephalic region in this form. The head presents posteriorly a median fissure flanked on each side by a large soft tubercle, which may aid in supporting the scale. A somewhat triangular area, with the broad base in front, completes the snout, the rounded anterior edge (which appears to be buccal rather than cephalic) folding over directly into the mouth. Inferiorly the scoop-like ventral lip projects considerably in front of the cephalic brim just mentioned. The broad posterior tubercles of the head narrow as they run forward, and end in a slight enlargement, which in the specimen shows no decided trace of an antenna. The palpi are comparatively short, tapering from base to apex, which is filiform. They arise beneath the posterior tubercles at each side. Between the first bristled foot and the latter is a sickle-shaped flattened lamella (corresponding to the first foot) bearing the tentacular cirri, which are short and filiform. The lamella is slightly enlarged at the tip, especially inferiorly. No trace of eyes occurs in the specimen. The great modification of the first foot (bearing the tentacular cirri) affords a marked contrast with *Iphione muricata*. In both, however, the mouth opens quite in front, and thus differs from the ventral position of the organ in *Lepidonotus*.

The scales are thirteen on each side. The first (Pl. IX. fig. 5) is somewhat ovoid, the rest are more or less elongated (fig. 6), narrower internally, wider externally, and with a well-marked median curve. The posterior and outer angle is rather acute in the posterior scales. The surface of attachment is unusually large and firm. The structure of each areola respectively in *Iphione muricata* and this species differ, the former presenting (when the scale is viewed as a transparent object) an arrangement like the cells in cork, the latter having a larger amount of chitinous tissue in the intersecting walls of the spaces. The outer margin bears a series of well-marked cilia, which in the first scale pass nearly all round. Along the anterior margin of this scale also there is a tendency to the grouping of the cilia on a basal web or pedicle, which shows a bifid, trifid, or other subdivision at the tip. Moreover, the homology of the spaces in the areæ is indicated by their transition into spines in the same scale. The scales are brittle, and fracture seems always to take place along the junctions of the more or less hexagonal areæ. The scar for the attachment of the scale does not exhibit the well-marked accessory process externally, so characteristic of *Iphione muricata*. In vertical section the scales present a beautifully regular series of thin chitinous septa, which run from the surface to the base. Each of the little areas of the rounded dorsal papillæ is thus mapped out.

The dorsal division of the foot bears a dense tuft of light coloured hairs, which are considerably shorter than the ventral bristles, so that the latter constitute the prominent points along the sides of the body, whereas in *Iphione muricata* these are formed by the dorsal bristles. Part of this prominence, however, is in the present species due to the

greater length of the foot generally, as well as that of the ventral bristles. In the dorsal bristles of *Iphione muricata* there is a well-marked difference between the lower and the distal spinous rows, the former being wide, the latter most regular and close, the whole tip having a broader aspect than in the other species. The entire spinous arrangement is also more lax (Pl. VIIIA. fig. 7). In ordinary views the bases of the spines are opposite, as in the former species.

The ventral division of the foot is furnished with paler bristles than in *Iphione muricata*. The upper have elongated tips and well-marked spinous rows, the extremities being longer than in *Iphione muricata*. The next series (Pl. VIIIA. fig. 8) are also proportionally longer, and their spinous rows less prominent. The smooth portion with the hook at the tip is evidently longer than in *Iphione muricata*, and the curve in front is different. The upper part of the shaft (below the tip) is slightly marked by indications of spinous rows. On the whole the rows of spines are much more distinctly marked in *Iphione muricata*.

The dorsal cirri have an enlargement below their basal segment. The latter is large and cylindrical, and appears almost to represent the body of the organ. The absence of the papillæ on its surface, however, makes its homology clear. The cirrus proper is only about twice the length of the basal division, and is in the form of a slender tapering process covered with rather large clavate cilia. The organ seems to be capable of a certain degree of invagination within the basal part. The cirri of *Iphione muricata* are much longer, and correspond more with the ordinary structure, showing a short basal division, a long tapering ciliated shaft, dilating at the tip, and having a filiform process (which is longer than the cirrus proper in the present species) appended to the latter. Moreover, the cilia on the surface are much longer and less clavate than in the form from the Challenger. The cirri scarcely reach the extremities of the dorsal bristles.

The ventral papilla is just indicated in this species as in *Iphione muricata*, and in this respect diverges from *Lepidonotus*.

In transverse section the body-wall differs from *Lepidonotus squamatus* in the longer interval between the insertion of the oblique muscles in front and the smallness of the flattened nerve-area. The muscular wall of the region, moreover, is comparatively thin, and in marked contrast to the species just mentioned. The hypodermic layer of the proboscis is perhaps more lax and areolar than usual.

Kinberg very justly separates the genus *Iphione* from the other Polynoidæ by a wide interval, and when to his other characters the opposite condition of the pinnæ or spikes of the dorsal bristles is added, the distinction is even more decided. The remarkable condition of the head and the absence of eyes in the present form are noteworthy. De Quatrefages' species, *Iphione glabra*, *Iphione cimex*, and *Iphione fimbriata*, seem to be in need of re-examination, especially as he found no cilia on the scales of Kinberg's *Iphione ovata*. His descriptions are not sufficiently precise to give certainty, and much

time is wasted in such a case without an adequate result. The *Lepidonotus dictyolepis* of Haswell,[1] from Watson's Bay, Port Jackson, appears to approach this genus (*Iphione*) so closely that it may be placed under it.

So little has been said about the typical species of this genus (*Iphione muricata*, Savigny[2]) that it has been thought proper on the present occasion to point out several additional features so as to elucidate the relations of the foregoing form. Besides the characters of *Iphione muricata* (Pl. IX. fig. 7) already given by Savigny, it may be mentioned that the outer border of the scales is furnished with peculiar spinous papillæ. The latter are loosely attached to the edge of the scale, so that they are very mobile. The spines on the papillæ were probably overlooked by Savigny, and they are frequently enveloped in muddy debris. Various ciliary growths also occur both on the scale and the spinous processes. The cicatrix on the dorsum of the foot for the attachment of the scale is remarkably large and long, and, moreover, there is an accessory surface appended to its anterior edge, externally. The dorsal bristles form a dense tuft at the anterior superior border of the foot, and consist of a central axis supporting a series of spikes like those of certain grasses. The secondary processes or pinnæ, which, unlike those of the Polynoidæ proper, are opposite, at first are somewhat adherent, then gradually become more closely arranged and more produced laterally, and by and by terminate in a slender tip. The ventral bristles have a simple hook at the extremity, and beneath a close series of transverse spinous rows.

Whether Kinberg's *Iphione spinosa* is different from *Iphione muricata*, Savigny, or a variety is a doubtful point. The statement that the head resembles that of *Iphione ovata* would seem to favour the latter view. It would have saved ambiguity, however, if he had clearly said in what respects the head differed and in what respects it agreed with Savigny's *Iphione muricata*. Grube,[3] again, correctly notices the presence of a small cephalic tubercle in the middle line posteriorly. He also speaks of the ventral papilla (or mamilla) as commencing on the fourth segment, but this is of little consequence, since the elevation indicating its presence is even more anterior. He does not mention spines on the cilia of the scales, which the addition of glacial acetic acid brings out very boldly, though it does not produce evidence of the carbonate of lime he mentions in their tissue. Such calcareous matter was probably extraneous, and thus deceived my friend, for sponges and other growths are common on the scales, which are essentially chitinous. Schmarda's *Polynoë peronea*[4] from Ceylon appears to be very closely allied to the foregoing if it be not identical therewith.

[1] *Proc. Linn. Soc. N. S. Wales*, vii. p. 287.
[2] Syst. des Annél., p. 21 ; Annél. gravées, pl. iii. fig. 1.
[3] Anneliden Fauna d. Philippinen, p. 21.
[4] Neue wirbell. Thiere, I. ii. p. 157, Tab. xxxvi. figs. 315, 316, *a*.

Euphione, n. gen.

Euphione elisabethæ, n. sp. (Pl. IX. fig. 3; Pl. XVII. fig. 7; Pl. XVIII. fig. 10; Pl. VIIIA. figs. 3–6).

Habitat.—Dredged at Station 142 (south of the Cape of Good Hope), December 18, 1873; lat. 35° 4′ S., long. 18° 37′ E.; depth, 150 fathoms; bottom temperature 47°·0, surface temperature 65°·5; green sand.

Length about 35 mm., breadth at the widest part (including bristles) 23 mm.

A large and remarkable form, the stalked and rotate papillæ giving the back a characteristic appearance. The body is broadly fusiform or nearly elliptical in outline, and is only a little less elevated ventrally than dorsally.

The head somewhat resembles that of *Lepidonotus*. The eyes occupy the postero-lateral border of the head, and are so close as to be almost connate. They are nearer each other and much less distinct than those of *Iphione muricata*. The tentacle is of moderate length, reaching a little beyond the palpi, and narrows below the distal enlargement from which the filiform tip proceeds. The two latter parts are whitish while the column is greyish. The antennæ are of similar colour and shape, and are proportionally long. The tentacular and dorsal cirri follow the same outline, and the constriction below the swollen tip is in all well shown. The palpi are covered by a series of long conical papillæ which give them a very hirsute appearance (under the microscope). These papillæ show a crenated internal region, and the tip is in many furnished with a palpocil. They are continued to the tip of the organ, though the distal papillæ are short. All the cirri have a dense cuticle, except at the tip, and though many adventitious structures (*e.g.*, mud and sponge-spicules) are attached, their surface is quite smooth. The ventral cirri are subulate and proportionally large. The ventral papillæ (or mamillæ) are much more prominent than in *Iphione*, but somewhat less than in *Lepidonotus*. They become distinct on the seventh foot, as in the latter. The mouth opens on the ventral surface as in *Lepidonotus*.

The scales are thirteen in number on each side, and therefore the same as in *Iphione*, but their texture is flexible and leathery, and their surface is studded with warts or papillæ as in *Lepidonotus*. The first scale is rounded, the rest more or less elongated transversely, so that the general shape is rhomboidal—the anterior edge, however, being incurved, and the posterior convex. The most characteristic feature is the presence of the peculiar rotate papillæ on their surface, some being small and adpressed, others large and elevated on a pedicle. These processes occur mostly on the inner region of the scales, the outer border being occupied by softer elongated spinose papillæ, which in shape somewhat resemble a prickly pear. Continuing along the border inward these gradually merge into irregularly rotate forms. The latter marginal papillæ are much

less than the great stalked rotate kinds which occur in an irregular, and sometimes very prominent, transverse row across the middle of the scale, and behind the minute papillæ which are overlapped by the preceding scale. With the exception of the anterior curve, the margin of the scale is furnished with cilia, of considerable length and with slightly rounded or bulbous extremities. The first scale is quite encircled by cilia. The cicatrix for the attachment of the scales is long, but it is less firm, and does not show the additional external process as in *Iphione muricata*.

In vertical section these scales present a dense series of vertical fibres running from the homogeneous and translucent inner surface to the outer (dorsal). The upper surface presents the granular papillæ, the large rotate kinds being hollow. All possess a similar structure, even the apparently smooth surface being covered, under a high power, by minute papillæ.

The dorsal division of the foot has a dense tuft of pale yellowish silky hairs which differ from those of *Iphione muricata* in being much more slender, and in having a very attenuate tip (Pl. VIIIA. fig. 3). The comparison of the extremities in the respective species is characteristic. The spines toward the tip are needle-like or capillary; lower down they assume the form of pinnæ (as seen laterally in Pl. VIIIA. fig. 4); moreover, the pinnæ agree with the arrangement in *Iphione* in being opposite, whereas in the Polynoidæ proper they are alternate. Inferiorly the spines diminish and disappear, the shaft being striated longitudinally as in *Iphione muricata*.

The inferior division of the foot bears a strong group of dull yellow bristles with simple slightly hooked tips (Pl. VIIIA. fig. 5), the rows of spines beneath being so developed as to form a densely bearded tip, the general arrangement being well seen in an antero-posterior view (Pl. VIIIA. fig. 6, which represents a smaller example). The superior bristles have longer tips than those figured, but their spines are somewhat shorter. Developing bristles, or at least those unworn, show a long tapering translucent process beyond the hook.

An elevated cuticular protuberance occurs behind and partly overlaps the head, and is most pronounced in the young animal. A double row of low papillæ runs backward from the foregoing on each side of the middle line. In neither is the development so great as in *Iphione*. A series of wart-like papillæ occur along the superior and posterior border of each foot, the processes being best developed in those carrying cirri, which are not present in *Iphione muricata*. The cuticle on the ventral surface is covered with minute papillæ.

The area between the insertions of the oblique muscles is of moderate length in the anterior third, and the nerve-cords are fairly developed. They are less flattened than in *Iphionella cimex*.

There is nothing remarkable in the extruded proboscis except that the basal process of the maxilla has an obscure elevation or two exterior to the teeth. In the alimentary canal of one example were fragments of amphipodous Crustaceans.

The specimens had numerous *Globigerinæ* amongst and under their scales and between their feet. An Ascidian also occurred on one or two scales.

This form leads by an easy stage from the genus *Iphione* to *Lepidonotus*. The general outline of the bristles agrees with *Iphione*, the head and scales with *Lepidonotus*.

A form with small and somewhat spinose rotate papillæ on the scales exists in the collection of the British Museum from the south side of Cook's Strait, New Zealand. The position of the eyes is similar in both, but the ventral bristles do not show the long hair-like spines, which, however, may have been abraded. It is very interesting to find a form closely approaching *Eiphione elisabethæ* in a region so distant.

Lepidonotus, Leach.

Lepidonotus squamatus (Linn).

Procured by the dredge at Station 75 (off Fayal, Azores), July 2, 1873; lat. 38° 38′ N., long. 28° 28′ W.; depth, 450 fathoms; surface temperature, 70°·0; volcanic mud.

The specimen is a small one, with a few Foraminifera parasitic on the scales. Verrill and Webster state that it occurs on the Virginian coast, North America.

Lepidonotus gymnonotus, Marenzeller (Pl. X. fig. 4; Pl. XVII. fig. 5; Pl. IXA. figs. 2, 3).

> *Polynoë* (*Lepidonotus*) *gymnonotus*, Marenzeller, Südjapanische Anneliden, i. p. 4, Taf. i. fig. 3, Wien, 1879.

Dredged in 8 to 50 fathoms water, off Kobé, Japan.

The length of the longest example is about 30 mm. and the breadth about 15 mm., which corresponds with the proportion of Marenzeller's specimens. His longest reached 40 mm., with a breadth of 19 mm.

As in *Lepidonotus squamatus* the head has an elongated appearance from the fact that the antennæ, instead of being inferior, are continuations of the anterior border of the snout, occupying, indeed, the position of the sharp peaks usually seen in other genera. The base of the tentacle is also somewhat inferior. The nuchal collar encroaches much on the head, so as quite to cover the tolerably large posterior pair of eyes, which are situated somewhat laterally on this region of the head. They are only partially seen from the dorsum. The anterior pair are placed on the lateral prominence of the head, a considerable portion of each, however, being visible dorsally. The tentacle does not reach the length of the tips of the palpi, and its basal region is much encroached on by the bases of the antennæ. The process exhibits a distinct swelling below the filiform tip, and similar features characterise the other cirri, which likewise are smooth throughout.

The antennæ are proportionally long. The palpi are large and thick, and show a marked inferior ridge, and as in others of the genus are largely exposed on each side of the bases of the antennæ; while the tentacular cirri are thrust considerably outward on very long basal portions. The ventral cirri are short and subulate, not reaching the bases of the ventral bristles. The ventral papilla (*mamilla ventralis* of Malmgren) is similar to that of *Lepidonotus squamatus*, commencing, as Marenzeller says, on the seventh foot, and apparently having an aperture in its bulbous end.

The scales are twelve pairs, of a dull leaden grey aspect, and with a white spot over the point of attachment, the dark pigment round the latter being very prettily fretted. The surface of the scale is minutely papillose under the microscope, but smooth to the naked eye, with the exception of the posterior division, which has a series of very distinct, though low, pale conical papillæ scattered over the surface, which thus has a slightly pustular appearance. Two specimens show scales of a pale (or nut-) brown hue, and there is a tendency for the papillæ to be grouped on the inner and posterior margin of the white spot. The papillæ are also comparatively few in number, the posterior group alone being conspicuous. There is no trace of cilia on the edge. These scales are very easily removed, this and the former feature contrasting with the condition in *Lepidonotus squamatus*. The *cellula* of Kinberg in the magnified fragment of the scale (*e.g.*, of *Lepidonotus cæruleus*[1]) appears to be an acicular papilla or spine with a broad base. In vertical section it presents a fibrillar aspect, the fibres passing from surface to surface. Opaque granular masses also occur here and there in the fibrous layer. When a thin piece of the margin is viewed as a transparent object it is areolar, as usual in the group.

The dorsal division of the foot is feebly developed, and bears a series of pale yellow slender bristles (Pl. IXA. fig. 2) with finely serrated (from rows of spikes) and tapered tips. They thus correspond in type to those of *Lepidonotus squamatus*.

The pale yellow ventral bristles, again, differ from those of *Lepidonotus squamatus* in the absence of the great spikes superiorly below the hook, in the more numerous rows of these, and in the curvature (Pl. IXA. fig. 3, representing an average example).

The bases of the anal styles or cirri unite behind the anus, which is thus, as in *Lepidonotus squamatus*, situated on the dorsum opposite the penultimate foot.

In the intestine of the large specimen were masses of sponge with very minute slender spicula, Diatoms, and muddy debris.

The nerve-area is comparatively limited, and the oblique muscles strong. The cords lie in the midst of connective tissue within the hypoderm. Internally are two strong bands of longitudinal muscles. Externally the ventral cuticle is thick and peculiarly granular; indeed the cuticle generally is minutely granular in section. The alimentary canal is surrounded by an inner circular layer, and an outer thick coat of longitudinal muscular fibres.

Dr. Marenzeller's specimens were procured from the same region.

[1] Freg. Eugen. Resa, &c., p. 14, Tab. iv. fig. 16, H.

Lepidonotus wahlbergi, Kinberg (Pl. XI. fig. 1; Pl. XVIII. fig. 8; Pl. Xa. figs. 15, 16).

Lepidonotus wahlbergi, Kinberg, Freg. Eugen. Resa, &c., p. 12, Tab. iv. fig. 14.

Habitat.—Found between tide-marks at Sea Point, near Cape Town, along with *Terebella*, *Sabella*, and *Sabellaria*.

This is a stout, stiff *Lepidonotus*. A large male specimen measures 36 mm. in length and 9 mm. in breadth, a size considerably exceeding that of Kinberg's examples.

The head has the usual aspect in *Lepidonotus*, the bases of the antennæ being rather more elevated than the base of the tentacle, the head in short being continued into the former. Two rather small eyes are situated at the posterior border, and are sometimes overlapped by the jugal fold; while two occur on the lateral prominence in front. The tentacle is somewhat longer than the palpi, and is characteristically dilated at the tip, which has a filiform termination. A band of dark pigment occurs near the base, and a narrow belt below the dilated tip. The antennæ arise from bases which have an hour-glass contraction and are epitomes of the tentacle. The cirri are like the foregoing in colour, the belt of dark pigment at the tip being especially conspicuous. All these organs are smooth. The brownish palpi taper gently from the base almost to the apex, at which a filiform termination appears in the preparation. In some a slight dilatation occurs below the tip. They are not smooth, as Kinberg says, but densely papillose. The long granular papillæ have a filiform terminal process. The ventral cirri are short, and in the preparation taper very little. They have a short filiform tip, which does not reach the base of the bristles. The ventral papilla is well formed, and in the female somewhat tulip-shaped, with about four lobes round the central cavity at the tip. The pigment at the base is streaked longitudinally, probably from the fluted condition of the process. Moreover, the papillæ are longer in the males than in the females, a feature best seen posteriorly.

The first pair of scales are rounded, of a whitish colour, and touch in the middle line. They are densely covered all over with prominent chitinous spines. The second pair have the anterior half whitish, the posterior blackish, with the exception of the pale area of attachment. The shape is more elongated, and the chitinous spines less prominent than in the first. The rest of the scales are variously mottled with blackish pigment, the area of attachment being whitish. The spines on the third pair are less prominent, and are evidently assuming the tubercular condition characteristic of the other scales. The outer margin is generally wrinkled and folded upward. The second pair of scales merely touch. The others for the most part leave a portion of the dorsum bare, or, as posteriorly, perhaps only touch at one point. The scales in section are dense. The upper and lower surfaces are chitinous, and the intermediate layer is narrow and firm, densely fibrous, and with brownish pigment where it adjoins the other layers. The dorsal surface is covered

by the large blunt spines which are solid, by various smaller forms, some of which are hispid, and by various adventitious structures, such as minute thread-like algæ and Infusoria like *Salpingœca*.

The feet are stiff and strong, bearing dorsally a series of pale, and ventrally a fascicle of dull, brownish bristles. The dorsal tuft consists of rather stiffly arranged and widely radiate bristles, almost in every case covered with adventitious growths, so that Kinberg's figure in the latter condition is indifferent. They are comparatively straight, stiff, tapering bristles with keen points and somewhat fine rows of serrations (Pl. Xa. fig. 15).

The ventral division bears bristles of more distinctly brownish hue, especially at the tip, which is strong and simply hooked, the spinous rows beneath having two strong spurs at their commencement as usual in allied forms (Pl. Xa. fig. 16 represents one of the smaller forms toward the inferior edge of the group). When seen from behind, the tip diminishes as a simple cone from the summit of the shaft.

The anus is opposite the last pair of feet. The alimentary canal in one contained fragments of an Amphipod.

The shorter, stiffer examples were females laden with ova; the longer forms, males.

The nerve-cords are somewhat flattened, but the area is of moderate length.

As Kinberg has pointed out, this is probably in part the *Aprodita squamata* of Pallas, who conjoined the European form as figured by Baster[1] with the foregoing from the Cape of Good Hope. It occurs at Port Natal as well as the Cape according to Kinberg. Its relation to Schmarda's *Polynoë trochiscophora*, from the same region, is uncertain, from the vagueness of his distinctive characters.[2] It is also closely allied to the *Lepidonotus semitecta* of Stimpson[3] from Simon's Bay, Cape of Good Hope.

Lepidonotus cristatus, Grube (Pl. XI. figs. 2, 3; Pl. XVIII. fig. 1; Pl. Xa. figs. 10, 11).

Polynoë cristata, Grube, Jahrb. d. schles. Gesellsch., für 1875, p 62.
Polynoë (*Lepidonotus*) *cristata*, Grube, Anneliden Fauna der Philippinen, p. 27, Taf. ii. fig. 3.

Habitat.—Dredged at Station 186 (Torres Strait), September 8, 1874; lat. 10° 30′ S., long. 142° 18′ E.; depth, 8 fathoms; surface temperature, 77°·2; coral mud. It occurred along with numerous examples of *Eunice torresiensis*.

A remarkable form having pale madder-brown scales with a dark brown spot over the area of attachment, behind which is a tuberculated bilobed crest, situated transversely (across the scale), and tipped with bright ochre-yellow pigment. The body is about 28 mm. in length and 12 mm. in breadth (including the bristles). The feet are twenty-six in number.

[1] Opusc. Subsec., vol. ii. lib. 3, pl. vi. fig. 5, A.B.
[2] Neue wirbell. Thiere, I. ii. p. 151, Taf. xxxvi. f. 310.
[3] Prodromus Exped. Ocean. Pacif. Septen., &c., *Proc. Acad. Nat. Sci. Philad.*, July 1855.

The head is somewhat like that in *Lepidonotus*, the base of the tentacle, however, being slightly elevated above the base of the antennæ. It presents two rounded hemispheres in front with a deep notch from which the base of the tentacle arises. Two rather large dark brown, circular eyes are situated on each side posteriorly, and two of an oval form and about twice the size on the rounded lateral eminence. The latter show a pale lenticular patch anteriorly. The tentacle springs from the elongated base before mentioned, is somewhat slender and translucent, and scarcely exceeds the tip of the palpus in length. A very distinct enlargement occurs at the tip, from which a long filiform process abruptly proceeds. The antennæ arise from basal segments which are slightly beneath the foregoing, and which proceed a very little farther forward. They are somewhat shorter than the tentacle, and the tip is rather smaller. The tentacular and dorsal cirri are similar to the tentacle, the surface of all is quite smooth, and the tissue somewhat translucent. The contour of the dorsal cirrus is characteristic, the column tapering from the largely dilated base to the narrow region below the tip, which again is broadly clavate, with an abrupt distal extremity from which the filiform process springs. A central opaque streak goes from base to apex. The cirri are of moderate length, reaching only to the tip of the ventral bristles. The palpi are comparatively short and conical, with a ridge superiorly and a short attenuated tip. The latter is smooth, but the rest of the surface has numerous lanceolate papillæ with central granules, so that the organ appears downy under a lens. The ventral papillæ are somewhat short, but otherwise correspond with the type. The specimen is a female laden with ova.

Only one or two scales remained attached, but the appearance of these sufficed to indicate that the species is probably one of the most brilliant of the group. The scales are large, somewhat soft, mottled throughout the dorsal surface with madder-brown touches, and with a large dark brown patch over the area of attachment. Behind the latter is a prominent cock's comb-like crest, directed transversely to the axis of the body, and with a narrower base than summit. The former extends more than half the diameter of the scale, while the latter is still longer owing to the upward dilatation. The crest is bilobed, with a hollow in the centre, and the free margin is covered with conical tubercles or papillæ with a globular base and a pointed chitinous summit. The sides of the crest are streaked with madder-brown, but the edges of the ridges are of a bright yellow, which stands boldly out from the fact that the pigment adjoining it is of a deeper brown shade than elsewhere. The coloration and the bilobed tuberculated crest remain with little change in the smaller posterior scales. The whole anterior area of the scale is dotted over with small but characteristic papillæ having a globular base, and one, two, three, four, or more chitinous spikes on the summit like a hand-bomb with its detonating points. Those least armed (*i.e.*, with one or two points) occur internally, those best armed are external. A few larger papillæ like those on the bilobed crest occur near the outer border. The number of the scales is twelve.

The parallel ridges and triangular tuberculated elevations on the scales of certain Australian Polynoidæ in the British Museum would seem to indicate stages in the production of these remarkable processes.

The dorsal branch of the foot bears a somewhat small tuft of slender and moderately elongated bristles (Pl. XIA. fig. 10). The tip is rather blunt and the smooth portion very short. The spinous rows again are somewhat small and closely arranged. The structure of the bristle thus differs very considerably from that of *Lepidonotus squamatus*.

The ventral bristles, on the other hand (Pl. XIA. fig. 11), have smooth simply hooked tips with a pair of very large spurs at the summit of the spinous rows. The latter are proportionally small.

The dorsum is characterised by the presence of a lozenge-shaped space imprinted on each segment so as to leave a deep indentation at the bases of the feet. The impressed space is marked by four, five, or six linear transverse parallel ridges. Moreover, immediately behind the head are two dermal processes, connate in the middle and free at the sides; and posterior to the foregoing are two small eminences or papillæ.

The anus opens nearly opposite the penultimate foot. Nothing of note occurred in the alimentary canal.

Prof. Grube states that the palpi (his *subtentacula*) are smooth, but, as mentioned, such is only the case to the naked eye. The accurate structure of the bristles also escaped him and still more his artist, for the beautiful and costly steel engravings of this work are unfortunately not reliable in regard to structure, and once more exemplifies the trite remark that every zoologist should be more or less an artist. In his specimens the elytra were flecked with white, and the dark pigment was greenish-black. It is probable that this well-marked species exhibits considerable variation in regard to colour. Grube's examples were procured by Semper at Pandanon, one of the Philippines.

Eunoa, Malmgren.

Eunoa iphionoides, n. sp. (Pl. XVII. fig. 4; Pl. VIIIA. figs. 1, 2).

Habitat.—Procured by the trawl at Station 166 (off the coast of New Zealand), June 23, 1874; lat. 38° 50′ S., long. 169° 20′ E.; depth, 275 fathoms; bottom temperature 50°·8, surface temperature 58°·5; Globigerina ooze.

A small form about 11 mm. in length, and including the bristles 6 mm. in breadth. It is of a uniform pale hue with the exception of the yellowish bristles and the minute black dots on the scales. The body is elongate-ovoid.

The head presents posteriorly two rather large eyes—wide apart, and two still larger

on the lateral eminence in front of these. All are seen from the dorsum. The tentacle is longer than the palpi, and shows a slight enlargement below the very long filiform tip. It springs from a large basal segment which occupies the middle of the anterior margin of the head. The antennæ are subulate, and their tips reach the terminal third of the palpi. The latter are of moderate length, with tapering tips. Only very minute papillæ (seen under a power of 350 diameters) occur on one side, so that they are comparatively smooth. The tentacular and dorsal cirri agree with the tentacle, the long filiform tips of the cirri projecting beyond the bristles. The dilated terminal region has rather long clavate papillæ, but these organs diminish above and below this part. The subulate ventral cirrus is furnished with shorter clavate papillæ.

There are fifteen pairs of scales, and they completely envelop the dorsum after the manner of *Iphione*. The first scale is rounded, dotted with the black spines, and bordered with rather long clavate cilia. The others (Pl. XVII. fig. 4) are studded with similar chitinous spines, the larger of which have the extrinsic blackish pigment, and cilia along their outer border. In section the tissue of the scale is dense. The scales are proportionally large and massive. They diminish in thickness from the surface of attachment to the margin.

The dorsal branch of the foot has a series of somewhat slender elongate bristles with comparatively short pointed tips (Pl. VIIIA. fig. 1, the figure representing a stoutish form, as some are much more slender). The rows of spines are well marked and distinctly separated. The longer forms are extremely slender toward the tip.

The ventral bristles again have simple hooked tips like those in *Eunoa*,[1] with well-marked row of spines. On the whole the terminal region is short (Pl. VIIIA. fig. 2).

The ventral area between the oblique muscles is of moderate size, and the cords are ovoid. The ventral cuticle is quite smooth. This form approaches *Lagisca* in the structure of the head and scales, but no bifid bristle occurs in the inferior group. It quite differs from *Iphione* in the character of the dorsal bristles and other particulars. It also comes near to *Polynoë macrolepidota* of Schmarda, from Auckland and New Zealand, but the spines on the scales of this species are much longer, and the cilia more abundant on the edge, as well as longer. Schmarda's figures[2] of the bristles are deficient in precision.

[1] I see no disadvantage in adopting Malmgren's genus *Eunoa*, on structural grounds. Dr. Hansen (Norske Nordhavs-Exped., p. 24) seems to have overlooked the essential characters which are common throughout the Polynoidæ, *e.g.*, the general correspondence of the dorsal cirri with the tentacle and tentacular cirri. Thus he makes a new species (*Polynoë islandica*) for a form in which the former processes are smooth while the latter are ciliated. If we bear in mind the characters just mentioned, it is probable that this imperfect specimen is an abnormal example of *Eunoa œrstedi*, Malmgren.

[2] Neue wirbell. Thiere, I. ii. p. 155.

Eunoa opalina, n. sp. (Pl. X. fig. 5; Pl. XIX. fig. 2).

Habitat.—Trawled at Station 311 (in the Strait of Magellan), January 11, 1876; lat. 52° 45′ 30″ S., long. 73° 46′ W.; depth, 245 fathoms; bottom temperature 46°·0, surface temperature 50°·0; blue mud.

The specimens are fragmentary, the longest measuring 25 mm. in length, and with the bristles about 12 mm. in breadth.

In the preparation the scales are milky, but no pigment is elsewhere present.

The head is distinguished by the great prominence of the lateral regions anteriorly, culminating in the widely separated peaks on each side of the tentacle. A pair of rather small transversely ovoid eyes are situated a little in front of the posterior border. Somewhat anterior to these, but yet behind the lateral median prominence, are a much larger round pair, which are barely seen from the dorsum. The tentacle rises abruptly from the large basal segment, and is comparatively short, its filiform tip not reaching the extremity of the palpus. It is pellucid, and shows no appreciable enlargement below the filiform termination. The slender tips of the antennæ extend about half-way along the tentacle. The palpi are quite smooth. The tentacular and dorsal cirri agree with the tentacle in shape, and have likewise a series of clavate papillæ, sparsely distributed, and as usual longest on the slightly tumid region below the filiform tip. The ventral cirri are tapered nearly from the base to the slender apex, and are quite smooth. There is only an eminence in place of the ventral mamilla.

The scales seem to be fifteen pairs, though neither example is perfect. They are soft, large, milky, as well as slightly translucent, and the dorsum is fully covered by the overlapping organs. Just within the posterior border are a series of soft papillæ arranged at intervals and visible under a lens. The first scale (Pl. XIX. fig. 2) is small and rounded, its soft papillæ are large though few, and all round its border are a series of microscopic clavate processes. Moreover, its anterior region shows minute papillæ scattered over the surface in considerable profusion.

The dorsal division of the foot bears a fascicle of pale yellow bristles, of moderate length, and in all enveloped in pale mud. The tip is smooth, slightly dilated in the middle, and with a peculiar double marking (Pl. VIIIA. fig. 9 shows an average example). The rows of spines are minute. An instance of a regenerated bristle (Pl. VIIIA. fig. 10), apparently after fracture, occurred amongst the others. This is rare, though the inherent recuperative power of these bristles is considerable.

The ventral branch carries pale yellow bristles with peculiarly long curved simple terminations (Pl. VIIIA. fig. 11). Very few forms occur with so decided a curve at the tip. The spinous rows are comparatively small.

An eyeless variety was trawled at Station 299 (between Juan Fernandez and

Valparaiso), December 14, 1875 ; lat. 33° 31′ S., long. 74° 43′ W. ; depth, 2160 fathoms ; bottom temperature 35°·2, surface temperature 62°·0 ; sea-bottom, blue mud.

It is of good size, 38 mm. in length, and 15 mm. in breadth inclusive of the bristles. The head is devoid of any trace of eyes, so that it forms another example of the influence of habitat on these important organs. The bristles and other parts correspond with the previous specimens. A developing foot exhibits setigerous lobe, cirrus, dorsal and ventral bristles in miniature, showing that the reproduction of all these parts occurs simultaneously, and that the peculiar characters of the bristles exist independently of size.

The intestinal canal of this example contained a quantity of dark brownish mud, in which were sponge-spicules, vegetable and other organic debris.

The ventral area is well marked, but thin, and the nerves are greatly flattened. The hypoderm externally is apparently diminished, but internally connective tissue and fibres form a protection. The cuticle is quite smooth.

Eunoa capensis, n. sp. (Pl. XV. fig. 5 ; Pl. XIA. figs. 1–3).

Habitat.—Found between tide-marks at Sea Point, near Cape Town, along with *Terebella*, *Sabella*, and *Sabellaria*.

A fragment of the anterior end of a tolerably large species (about 8 mm. in diameter). The scales are absent.

The head is characterised by the great size of the base of the tentacle, which occupies the whole front of the head. The tentacle itself is absent. The antennæ are somewhat short and cylindrical, with a filiform tip passing off abruptly from the former. The palpi are moderately elongated, tomentose under a lens, and when magnified show a dense coating of blunt lanceolate papillæ, which pass up to the base of the short filiform tip. A pair of small eyes lie at the outer and posterior border of the head, while a pair occur a little behind the anterior border, and lateral in position. The dorsal cirri are absent, but one of the tentacular cirri presents a very slight enlargement below the filiform tip, and a column rather closely covered with somewhat short and thick papillæ, having a nearly cylindrical outline.

The ventral cirri are very short.

The dorsal group consists of a small tuft of pale bristles, the structure of which is not readily made out from their peculiar twist, the tip (Pl. XIA. fig. 1, one of the shorter examples) ends in a somewhat blunt rounded process, below which, on the convex side, are a series of spinous rows. Some of the larger forms in the fascicle (*e.g.*, Pl. XIA. fig. 2) show a more extended smooth portion at the tip. A similar condition occurs in the much larger dorsal bristles of *Eunoa hispanica*[1] and an allied bristle appears in Kinberg's[2]

[1] *Trans. Zool. Soc. Lond.*, ix. p. 396.

[2] Freg. Eugen. Resa, p. 20, Tab. vi. fig. 29, Gs.

Antinoë pulchella, from the mouth of the La Plata. The ventral branch has translucent pale straw-coloured bristles with simple hooked tips (Pl. XIA. fig. 3), while beneath are a comparatively small number of spinous rows, which, indeed, somewhat approach the arrangement in *Lepidasthenia*; and perhaps this form may also possess an elongated body. The superior ventral bristles have much longer tips than represented in the figure, which shows an average or intermediate specimen.

This form approaches *Lepidasthenia* in the diminution of the dorsal bristles, and it does not seem to fall under *Eunoa*. There is nothing in the description or figures of Schmarda's *Polynoë trochiscophora*[1] to connect it with the fragment from the Challenger.

The ventral area between the oblique muscles is narrow, and the nerve-cords are of considerable size and ovoid in section. A few *Loxosomæ* are parasitic on the dorsal aspect of the feet.

Eunoa abyssorum, n. sp. (Pl. XIA. figs. 14–16).

Habitat.—Trawled at Station 160 (south of Australia), March 13, 1874; lat. 42° 42′ S., long. 134° 10′ E.; depth, 2600 fathoms; bottom temperature 33°·9, surface temperature 55°·0; red clay.

Unfortunately the specimen has been dried, and all its scales are absent. It measures about 27 mm. in length, and including the bristles 13 mm. in breadth.

The head appears to be devoid of eyes, a common feature in forms from such depths. The cirri are of considerable length. There are thirty-eight bristled segments including those bearing the tentacular cirri, and the points of attachment of fifteen scales are indicated.

Both sets of bristles are straw-coloured. The dorsal branch has a series of stiff, acutely pointed bristles, with the spinous region rather short, though the spines are distinct (Pl. XIA. fig. 14, which represents an average example amongst the longer kinds). The ventral bristles have a well-marked simple hook at the end of the smooth portion, and a comparatively short spinous region (Pl. XIA. figs. 15, 16—the former representing one of the longer, and the latter one of the shorter and smaller inferior forms). The smooth portion at the tip has a slight convexity on the anterior or spinous edge.

The brownish debris in the intestine contained remarkable link-like spicular plates, as if pertaining to a fantastically armed *Synapta*.

The advantage of having the assistance of the bristles in establishing an accurate diagnosis is well seen in the case of this injured and dried form.[2]

[1] Neue wirbell. Thiere, I. ii. p. 151, Taf. xxxvi. fig. 310.

[2] The *Lepidonotus bowerbankii* of Dr. Baird, from Australia, appears to approach this genus (*Eunoa*), having ventral bristles, with a simple hooked tip. The dorsal bristles again are slender, and the scales have cilia.

The ventral area between the oblique muscles is large, and the nerve-cords seem to be minute, forming a small flattened band on each side, at the edge of the great longitudinal muscle of the region. This separation, with atrophy of the cords, is peculiar, and merits further attention. The only doubt arises from the condition of the specimen, but this of itself could hardly cause the change.

Eunoa mindanavensis, n. sp. (Pl. XI. fig. 6; Pl. XVII. fig. 6; Pl. XIIA. figs. 7, 8).

Habitat.—Trawled at Station 201 (in Basilan Strait, off Mindanao, one of the Philippines), October 26, 1874; lat. 7° 3′ N., long. 121° 48′ E.; depth, 82 fathoms; surface temperature, 83°·0; stones and gravel.

A fragment of the posterior end of a well-marked species furnished with whitish papillose scales. The diameter of the specimen is 3·5 mm. including the bristles.

The scales (Pl. XVII. fig. 6) are pale throughout, somewhat ovoid, and densely covered with minute papillæ, interspersed with larger ones, which are quite visible under a lens. In front of the scar for attachment the papillæ are for the most part small, though a few larger occur amongst them, especially toward the outer edge. The latter is furnished anteriorly with short stout cilia, which, however, as we proceed backward, assume a spinose form. By transmitted light these blunt spines present a central granular region, with a constriction in the middle, and a clavate upper part, the whole strengthened by the translucent chitinous deposit externally, and having at the tip a pair of short prongs, rarely more.

The dorsal division of the foot bears a series of minute, pale bristles, strongly curved, the tips being acutely pointed and furnished with very fine (almost obsolete) serrations (Pl. XIIA. fig. 7).

The ventral series again consists of bristles with simple tips, which are pointed rather than hooked (Pl. XIIA. fig. 8, which represents an average example). The distal region is on the whole short and wide, and it is marked by very fine transverse striæ from the obsolete spinous rows.

The cirri, so far as can be ascertained from the fragment, are moderately elongated smooth tapering processes, with very slender tips. The ventral cirri extend beyond the bases of the bristles.

The specimen is a male, the sperm-masses filling up the area beneath the alimentary canal, and, indeed, extending both laterally and superiorly.

The nerve-area is small and almost spindle-shaped, as might be expected from its position.

This form apparently approaches Grube's *Polynoë ampullifera*,[1] from Bohol, one of

[1] *Op. cit.*, p. 35.

the Philippines; but both scales and bristles differ, especially in regard to the serration of the dorsal, and the expansion of the ventral tips. In regard to the structure of the bristles, it is somewhat allied to *Malmgrenia*.

Eunoa yedoensis, n. sp. (Pl. XV. fig. 4; Pl. XIX. fig. 9; Pl. Xa. figs. 11, 12).

Habitat.—Procured at Station 232 (a little south of Yedo, Japan), May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature 41°·1, surface 64°·2; green mud, in which several other families of Annelids were represented.

A small and rather elongated species, about 12 mm. in length and 3 mm. in breadth. There are about forty bristled segments.

The head (Pl. XV. fig. 4) is furnished with four very distinct eyes, two of which are placed wide apart at the posterior border, and a larger pair slightly in front of the lateral prominence. The latter are only fully seen from the side. The tentacle is absent. The antennæ are rather thick at the base but tapered at the extremity. The palpi are comparatively short, and have a filiform tip. The dorsal cirri are somewhat slender, and their tips are long and filiform. Beneath the latter the surface is covered with a number of somewhat cylindrical cilia, which toward the base of the cirrus become sparsely distributed and clavate. The ventral cirrus is subulate, and extends very slightly beyond the base of the bristles. The ventral papilla is a well-marked cylindrical process.

The scales (Pl. XIX. fig. 9) appear to be fifteen pairs. They are covered with numerous rather distinct papillæ, and have on the posterior surface and edge a somewhat dense series of cilia, longest and most abundant at the outer border. These cilia correspond in outline with those on the dorsal cirri, being almost cylindrical. Toward the inner border posteriorly they are short, sparsely arranged, and clavate. Such are not common in the group.

The dorsal division of the foot bears proportionally long translucent bristles, which have a remarkably extended smooth portion at the tip (Pl. Xa. fig. 11), the serrated region beneath comprising about eleven spinous rows. As the smooth portion at the tip considerably exceeds the spinous region in length, the latter is thus placed near the middle of the bristle. This form of bristle is peculiar and rare.

The ventral branch, again, has a series of translucent bristles with rather short and broad tips, simply hooked (Pl. Xa. fig. 12, representing an intermediate form). The fine serrations on the edge are numerous and closely arranged. The setigerous inferior lobe slopes acutely upward from the ventral surface to the spine, thus giving a pointed character to the entire region.

The nerve-cords are somewhat flattened. The area is comparatively narrow.

Polyeunoa, n. gen.

Polyeunoa lævis, n. sp. (Pl. XII. fig. 2; Pl. XX. fig. 8; Pl. VIIA. figs. 12, 13).

Habitat.—Numerous examples were dredged at Station 145A (off Prince Edward Island), December 27, 1873; lat. 46° 41′ S., long. 38° 10′ E.; depth, 310 fathoms; surface temperature 41°·5; sea-bottom, volcanic sand.

Two fragmentary specimens also occurred at Station 310 (in the Strait of Magellan), January 10, 1876; lat. 51° 27′ 30″ S., long. 74° 3′ W.; depth, 400 fathoms; bottom temperature 46°·5, surface temperature 50°·5; blue mud.

The body is extremely elongated, indeed, with the exception of *Achloë astericola* and *Polynoë scolopendrina* it exceeds all the British species, and approaches *Lepidasthenia* in this respect, though it quite differs in the structure of the bristles from the latter. In regard to fragility it certainly leans to the former. The length of some of the longer examples is about 55 mm., and the greatest breadth (including the bristles) about 11 mm. The number of bristled segments varies from seventy-three to seventy-five in such specimens. The body is either pale, or marked along the dorsum by very regular touches of madder-brown, which occupy in some the entire breadth of the dorsum, but in others diminish to a slender streak of pigment in the centre. The ventral surface is either pale, or in those with much dorsal pigment has a tinge of the same colour along each side anteriorly.

The head is pale, with two moderately large black eyes situated wide apart at the posterior margin, and they are only partially visible in a dorsal view. Each has a whitish speck in the centre. The anterior pair are placed on the lateral prominence, their pigment being carried somewhat in front of it. They are larger than the posterior pair, and also have a distinct white speck in the centre. The marginal position of all the eyes gives a wide clear space in the centre of the head. The tentacle is a slender, elongated, tapering process arising from a broad base. It considerably exceeds the palpi in length. The antennæ are likewise long, and taper to a filiform extremity, which reaches about two-thirds along the palpi. The tentacular cirri are also long, the upper exceeding the palpi in length, and the tip is filiform. The dorsal cirri are of the same tapering filiform character, with very long attenuate tips. The surface of all these processes is perfectly smooth. The palpi are of average length, smooth, and with a pointed tip. The smooth ventral cirrus is comparatively long, extending considerably beyond the base of the bristles. The ventral papilla is slightly developed, appearing as a small bluntly conical process posteriorly. Two long tapering styles come off below the anus, and terminate the body.

The feet have somewhat the appearance of those in *Achloë astericola*, the

dorsal bristles especially being few and short. They consist of a series of short pale yellow bristles, which show only a very faint trace of the spinous rows (Pl. VIIA. fig. 12). The points in a lateral view are somewhat blunt, and there is a characteristic curvature in the same position. When viewed antero-posteriorly, however, they are nearly symmetrical in outline, narrowing as they emerge from the skin, dilating, and again diminishing toward the tip.

The ventral bristles, again, have simple, broad hooked tips (Pl. VIIA. fig. 13), and somewhat short spinous rows beneath. In simplicity they resemble those of *Eunoa*, *Nychia*, and *Achloë*, and, perhaps, though the curvature at the tip differs very considerably, they are nearest to the latter. They are much longer proportionally than the dorsal bristles.

The scales are nineteen pairs, overlap considerably in front, but not in the central or posterior region of the body. They are perfectly smooth, somewhat thin, translucent and milky, and have the scar for attachment very eccentric. The latter is situated toward the outer and anterior margin in those in front, while in the posterior the scar more nearly approaches the middle of an antero-posterior line drawn through the scale. They show numerous branching nerves.

The species is remarkably free from parasites on the bristles or other parts.

The alimentary canal in those examined was quite empty. In the debris from the anus of one example were many granular cells, probably from the surface of the canal.

The extruded proboscis is short, and has the usual nine papillæ dorsally and ventrally. The maxillæ are dark brown, and as usual lock alternately. In section the muscular walls of the body seem to be largely developed, while the proboscis is proportionally small, and in the anterior third it is surrounded by a muscular ring. The nerve-cords are comparatively thick, and have an area of somewhat lax hypodermic tissue in the central line beneath them, giving rise in some views to a perforated appearance. The ventral area is narrow.

Dr. Baird's *Hermadion magalhænsi* resembles this form in the length of the body and smoothness of the scales, but differs in the structure of the bristles, the dorsal being comparatively smooth and the ventral having a bifid tip.

Dasylepis, Malmgren.

Dasylepis equitis, n. sp. (Pl. XXXII. fig. 7; Pl. XXXIXA. figs. 5, 6).

Habitat.—Dredged by H.M.S. "Knight Errant" in the Færöe Channel at Station 8, August 17, 1880, in 540 fathoms; bottom temperature 29°·5, surface temperature 56°·5; ooze.

The specimen consists of a fragment of the posterior end about 9 mm. in length and 8 mm. in breadth. It has three pairs of scales.

The scales are not so firmly attached to the dorsum as in *Lepidonotus squamatus*, though more so than usually seen in the group. Each is irregularly rounded, and the exposed part covered with clavate or rather pedicled tubercles, with broad, truncated tips. Moreover, each tubercle has its summit studded with minute truncated papillæ (Pl. XXXII. fig. 7). As usual the tubercles increase in size from the anterior to the posterior border, over which they project. Each scale has in addition at the posterior edge a tubercle or two far surpassing the rest in size, and with the convex summit rendered nodular by numerous processes, so that each bears a resemblance to the remarkable papillæ of *Iphione muricata*.

The posterior and outer margins are furnished with numerous long and closely set cilia.

The dorsal cirrus has a long bare filiform tip, and the rest is densely ciliated. The slender ventral cirrus shows a few short clavate cilia. The ventral papilla does not project.

The dorsal division of the foot bears a series of bristles which somewhat resemble those of *Dasylepis asperrima*, but which are nevertheless easily distinguished. They are much less acute at the tip (Pl. XXXIXA. fig. 6), showing instead of the simple pointed condition, a peculiar blunt tip, with a minute buttress or process on the anterior edge, just below it. The spinous rows in the new form are also longer.

The ventral bristles (Pl. XXXIXA. fig. 5, representing one of the inferior or shorter forms) quite differ from those of *Dasylepis asperrima*, in possessing shorter spinous rows, and in the absence of the secondary process below the tip. The latter, it is true, is not evident in every bristle of *Dasylepis asperrima*, but it is very plain in others.[1] It is doubtful whether Malmgren is incomplete in his description, or had overlooked this feature in the specimen in the British Museum. In the new form, at any rate, none of the tips are bifid; indeed the region below the terminal hook has a tendency to widen out above the spinous rows as in *Eunoa*.

Lagisca, Malmgren.

Lagisca propinqua, Malmgren.

Dredged by H.M.S. "Knight Errant" in the Færöe Channel at Station 5, August 11, 1880, in 515 fathoms; bottom temperature 45°·5, surface temperature 56°·6; ooze; two small examples. Langerhans found it at Madeira.[2]

Lagisca tenuisetis, n. sp. (Pl. II. fig. 7; Pl. XVIII. fig. 9; Pl. VIIA. figs. 5–9).

Dredged off St. Vincent, Cape Verde Islands, July 1873.

A single fragmentary example, measuring 8 mm. in length and 2·5 mm. in breadth.

[1] *Trans. Zool. Soc. Lond.*, vol. ix. pt. 7, pl. lxvii. figs. 10, 11.

[2] Die Wurmfauna Madeiras, *Zeitschr. f. wiss. Zool.*, Bd. xxxii. p. 275.

The body is on the whole pale; a faint greyish tinge, however, occurs along the middle of the dorsum and on the scales, and a little brownish pigment on the folds of the mouth anteriorly.

The head is distinguished from *Lagisca propinqua*, Mgrn, *Lagisca jeffreysii*, M'I., and *Lagisca rarispina*, Sars, by the much larger size of the eyes; indeed, it resembles *Evarne* in this respect, though the basal portion of the tentacle is much diminished, and the points of the head on each side less conspicuous; and while the posterior pair of eyes are nearer each other, the trapezoid formed by the eyes is smaller than in any of the foregoing. The tentacle has a proportionally slender base, and in the specimen (which probably is imperfectly developed) the distal region is short, and rapidly terminates in a filiform extremity. It has a somewhat sparse series of clavate papillæ. The antennæ are short and filiform. The tentacular cirri agree with the tentacle. The palpi are comparatively long and pointed, and show peculiar bifid papillæ.

The first scale is more or less rounded, and studded with somewhat large papillæ, a conspicuous row considerably exceeding the others in size occurring along the posterior border. The shape of the succeeding scales alters to the elongate type in the usual manner, and their free surface is covered with large papillæ, the posterior row being visible under a lens. A few long cilia also occur on the latter border (Pl. XVIII. fig. 7).

Both the dorsal and ventral bristles are pale. The former (Pl. VIIA. fig. 5, representing an intermediate example) are characterised by remarkably close rows of spikes. The longer forms (Pl. VIIA. fig. 6) have more attenuate extremities.

The ventral bristles consist superiorly of a series (Pl. VIIA. figs. 7, 8) with distinctly alternate rows of spikes, the bifid portion at the tip in some being imperfectly seen from its minuteness. The rows of spikes are boldly marked and long. Toward the middle of the series the peculiar character of the bifid tip (Pl. VIIA. fig. 9) is evident, and its distinction from that in any of the known forms is clearly demonstrated. All the bristles are very translucent and delicate.

The size and arrangement of the eyes, the minute structure of the scales, and the structure of the bristles, are characteristic. Thus, in comparison with *Lagisca propinqua*, Mgrn., to which perhaps it comes nearest in regard to the scales, it diverges much in the structure of the tips of the ventral bristles and in the arrangement and size of the eyes.

Grube has a *Polynoë tenuisetis*[1] from Rio Janeiro, but the pellucid smooth scales distinguish it from the foregoing. The *Polynoë zonata* of Langerhans,[2] from Madeira, approaches the form described above in the structure of the head and its appendages, and in the size of the eyes, but it deviates considerably in the structure of the bristles, which resemble those of *Lagisca propinqua* rather than the present species.

[1] Annulata Œrstediana, p. 20.

[2] *Zeitschr. f. wiss. Zool.*, Bd. xxxii. p. 275, Taf. xiv. fig. 5.

Lagisca antarctica, n. sp. (Pl. XIII. fig. 1; Pl. XVI. fig. 3; Pl. XVIII. fig. 1; Pl. VIA. figs. 10, 11).

Habitat.—Numerous examples were dredged at Station 144A (off Marion Island), December 26, 1873, in 69 fathoms, amidst a profusion of other Annelids; lat. 46° 48′ S., long. 37° 49′ E.; surface temperature, 41°·0; volcanic sand. Some young specimens were also procured at Station 149H, off Christmas Harbour, Kerguelen, January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; in 127 fathoms, amongst the debris of *Evarne kerguelensis;* surface temperature, 39°·0; volcanic mud.

The length of a large specimen is 40 mm., and the breadth including the bristles about 15 mm.

The outline of the body presents a somewhat rapid diminution posteriorly. Dorsally it is in several marked (beneath the scales) with brownish pigment, in bold and rather symmetrical touches. The ventral surface is pale, with the exception of a few flakes of brown at the mouth, and at the base of the ventral bristles.

On viewing the head from the dorsum, only the large posterior pair of eyes are distinctly seen, a little in front of the nuchal fold, and widely separated from each other (Pl. XVI. fig. 3), or just within the external border. The anterior pair are lateral, occupying a position somewhat in front of the middle line of the head, and only partially visible from the dorsum. They are, however, even larger than the posterior pair. The head is quite pale (whitish) in the preparation, and its iridescent cuticle is peculiarly wrinkled. The basal segment of the tentacle is whitish inferiorly, but toward the tip has two lateral brownish touches. The process itself is comparatively pale, only a little brownish pigment occurring beyond the dilated region. The basal division of the antennæ is also brownish, as likewise is the cylindrical region beyond and the lower part of the terminal filiform process. The dilated part is thus conspicuous by its whitish hue. The tentacular cirri have the centre of the cylindrical region pale, the basal and terminal portions brownish, while the enlarged part is pale, and the base of the filiform tip is brownish. The basal division is pale. The dorsal cirri generally present a slightly brownish basal division, followed by a deep brownish band at the base of the distal portion, fading toward the middle of the process, then a pale central region, a brownish region below and another beyond the pale enlarged part. The filiform tip is somewhat long. All the cirri are furnished with rather elongate clavate papillæ. The palpi are coloured pale brown, and have rather distinct papillæ with bluntly acuminate tips. The ventral cirrus is filiform and smooth. The ventral papilla occurs in its ordinary position, and is fairly developed as a slightly tapering process.

The papilla from which the dorsal bristles spring is tinted of a deep brownish hue, as also is the cuticular sheath of the spine. The bristles have the ordinary character of the genus, one of the intermediate forms being represented in Pl. VIA. fig. 10. The

tip has a peculiar knife-edge appearance on the anterior or spinous margin. Parasitic *Loxosomæ* are frequently attached to them.

The ventral bristles (Pl. VIA. fig. 11) are long and slender, but the tips conform to the structure in *Lagisca*, the weak secondary process being diagnostic. The pigment alluded to in the dorsal division is continued to the spinigerous process of the ventral, and nearly forms a ring round it. An *Exogone* with its buds occurred amongst the debris on these bristles.

The scales (Pl. XVIII. fig. 1) are fifteen pairs, their most prominent feature being a series of characteristic rotate (almost globular) papillæ along the posterior border. The first scale as usual is rounded, and besides the conspicuous papillæ along its posterior border, a group of smaller processes occurs in its centre, and a few larger appear over the central region of most posteriorly. The scales are mottled with brownish pigment, which is situated under the spinose dorsal cuticle, and often show a dark brown patch in the centre. Besides the numerous conical papillæ, a fringe of cilia occurs along their outer border. The latter are longest on the posterior scales, which also have a few elongated papillæ instead of the globular processes on the posterior border. The surface of the scale is minutely spinous; and most present a curiously thickened and elevated area toward the posterior part of the inner border.

The cuticle on the under surface of the scale is continuous with that of the scale-papilla, the thickest part of the organ occurring just over this region, the hypoderm dipping downward at the point of attachment, while the roof of the scar forms an arch, so that the area is thinnest in the middle. In the hypoderm of the dorsal process for the scale are a series of muscular fibres, vertical, circular, and oblique, so that considerable motion is provided for. In one of the sections, moreover, a rounded cellulo-granular body like a ganglion with a branch or two was situated just below the muscular fibres, beneath the scale. A thin stratum or layer, apparently continuous with the hypoderm, bridges over the summit of the scale-pillar. The fibres of the hypoderm of the scale are directed in a radiate manner from the fold of attachment to the scar, sloping inward and upward to the arch, to the central line of which many go, and interlace with others in a very complex manner.

The alimentary canal contained elongated masses, amongst which fragments of sessile-eyed Crustacea, soft odontophorus Mollusca, probably Pteropods, and quantities of Diatoms, which seem to have been in the stomachs of their prey.

This species approaches Grube's *Polynoë vesiculosa*,[1] procured during the expedition in the German ship "Gazelle," from the Strait of Magellan. Both have slightly bidentate tips to the inferior bristles, and the structure of the scales is closely allied. It diverges in the colour of the dorsal cirri, and in the structure of their cilia, which are stated to be setiform in *Polynoë vesiculosa*. Grube's example was only 21 mm. in length, and

[1] *Monatsber. d. k. preuss. Akad. d. Wiss. Berlin*, August 1877, p. 514.

had neither palpi nor tentacular cirri. The *Polynoë antarctica* of Kinberg,[1] from the same region, differs in the structure of the scales, cirri, and bristles.

Lagisca magellanica, n. sp. (Pl. XIII. fig. 5; Pl. XVIII. figs. 3, 4; Pl. VIIA. figs. 1, 2).

Habitat.—Procured by the trawl at Station 308 (Strait of Magellan), January 5, 1876; lat. 50° 8′ 30″ S., long. 74° 41′ W.; depth, 175 fathoms; surface temperature, 51°·7; blue mud.

Also from Station 149H (off Christmas Harbour, Kerguelen), January 29 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; surface temperature, 39°·0; volcanic mud.

The largest example (from Station 308) measures 32 mm. in length, and with the bristles is 10 mm. in diameter.

In some the dorsum is tinted light brown, but the ventral surface in all is pale.

The head is somewhat broad and large, and furnished with four conspicuous eyes, two of which are situated at the posterior border and wide apart, and two (the larger) on the lateral prominence (Pl. XIII. fig. 5). This arrangement of the eyes seems to be common in *Lagisca*. The head and the basal division of the tentacle are quite pale. The distal portion of the latter is equally pallid, nearly cylindrical, or with very slight enlargement below the filiform tip. The antennæ and tentacular cirri are also pale and conform to the same structure; moreover, all these processes are covered with moderately long clavate papillæ. The palpi are pale, and under a high power quite smooth, only the fine crenations of the contracted cuticle and hypoderm being visible. The ventral cirrus is quite smooth; and the ventral papilla, though less developed in this genus than in *Lepidonotus*, is fairly prominent, and directed posteriorly between the feet.

The scales appear to be fifteen pairs, though none of the examples is complete. The first is rounded and covered with a dense series of small spines, while round the free border are numerous cilia which are slightly clavate and somewhat short (Pl. XVIII. fig. 3). The surface of attachment presents in this and all the others a narrow brownish ring. A first scale had apparently two *umbilici*, but the origin of the second mark is uncertain. The first scales are either pale or flecked with brownish grains. The succeeding are marked with similar grains, and in some also have a very distinct brown pigment-patch in the centre. If the latter be well developed the accessory grains are few or absent; whereas when the grains are abundant the central area is rather an aggregation of grains than a well-marked pigment-patch. The scales are delicate and translucent, the anterior having a slightly pinkish or skin hue, and the eyes are seen through them. The only opaque parts are the spines (Pl. XVIII. fig. 4). The latter

[1] *Op. cit.*, p. 23.

occur also on the posterior scales, which show a few short cilia on the outer and posterior borders.

The dorsal division of the foot bears a group of pale yellowish bristles (Pl. VIIA. fig. 1, representing an average form) having a bare tip, and a series of short closely arranged spines along the side. Some of the longer bristles of this branch are of course more attenuated than that figured, while on the other hand the shorter kinds are more distinctly curved and stouter.

The ventral part bears similar pale yellow bifid bristles, which are both slender and translucent (Pl. VIIA. fig. 2, one from the middle of the series). The tips on the whole are rather short, but the rows of spines are well marked.

Fragments of Amphipods with strongly hooked claws and groups of long pin-shaped spicules of sponges occurred in the intestine of a specimen from the Strait of Magellan.

The median ventral area is of moderate size, and the cords, though flattened, are distinct.

The *Hermadion longicirratus* of Kinberg,[1] from the same region, somewhat approaches the foregoing, but diverges in the minute structure of the head, scales, and bristles. His *Harmothoë spinosa*[2] seems also to be an allied form, but it differs in the structure of both dorsal and ventral bristles, and more obviously in regard to the structure of the scales. It likewise came from the Strait of Magellan. The same may be said of Grube's *Polynoë fullo*[3] from the same habitat (procured in the German ship "Gazelle"), for he states that the palpi (his subtentacula) are furnished with minute papillæ, while in *Lagisca magellanica* the organs are smooth. Moreover, there are none of the long conical papillæ near the posterior margin of the scales as in Grube's species. The *Harmothoë spinosa*, Kinberg, of Dr. Baird seems to be allied in the closest manner, but as the only specimen examined in the collection of the British Museum is devoid of scales, some ambiguity remains.

Lagisca magellanica, var. *murrayi* (Pl. XIX. fig. 1; Pl. IXA. figs. 13, 14).

Habitat.—Trawled at Station 310 (Strait of Magellan), January 10, 1876; lat. 51° 27′ 30″ S., long. 74° 3′ W.; depth, 400 fathoms; bottom temperature 46°·5, surface temperature 50°·5; blue mud.

The specimens are fragmentary, but the form seems to be about the size of the ordinary *Lagisca magellanica*. It comes very near the latter and var. *grubei*, but differs from both in the greater comparative length and more pointed nature of the dorsal bristles, though *Lagisca magellanica* most resembles it in this respect. In neither of the other forms is the dilated condition of the smooth terminal portion of the

[1] *Op. cit.*, p. 22, pl. vi. fig. 33. [2] *Op. cit.*, p. 21, pl. vi. fig. 31. [3] *Op. cit.*, p. 515.

ventral bristles so well marked, and the same bristles are much longer than in the forms mentioned. The ventral cirrus of the present form is decidedly larger than in var. *grubei*. The dorsum is marked by short brownish bars which are seen through the scales. The eyes have slight "lenses" in var. *murrayi*.

Most papillæ occur on the scales and dorsal cirri of *Lagisca magellanica*, and var. *murrayi* differs from var. *grubei* in this respect in having rather longer cilia on the dorsal cirri, the basal pedicle of these, moreover, being more distinctly outlined from the dilated terminal region. The area of the spines on the outer edge of the scale is limited (Pl. XIX. fig. 1).

One of the average dorsal bristles is seen laterally in Pl. IXA. fig. 13. Its point is somewhat more acute than in *Lagisca magellanica*, and decidedly more so than in var. *grubei*.

The bifid condition of the ventral bristles (Pl. IXA. fig. 14) is less marked than in var. *grubei*, but it comes near *Lagisca magellanica* in this respect.

No further information is obtained by an examination of transverse sections of the body-wall.

Lagisca magellanica, var. *grubei* (Pl. III. fig. 5; Pl. XVIII. fig. 2; Pl. VIIA. figs. 14–16).

Habitat.—Several specimens were dredged at Station 145A (off Prince Edward Island), December 27, 1873; lat. 46° 41′ S., long. 38° 10′ E.; depth, 310 fathoms; surface temperature, 41°·5; volcanic sand.

This form occurred amongst the examples of *Polyeunoa levis*, and was only discriminated on minute examination. It resembles the latter in its fine iridescence, its pale colour and whitish scales, but differs in having a broader and shorter body, longer and more numerous dorsal bristles, both of which, moreover, possess a slightly deeper colour. It is interesting to find two from the same ground thus mimicking each other.

The length of the longest is 38 mm., and its breadth including the bristles 11 mm. There are forty-five bristled segments.

The head (Pl. III. fig. 5) has two very prominent points anteriorly. Two eyes, widely removed from each other, are situated at the posterior edge, and two, still more widely apart, on the lateral prominence, and only partially visible from the dorsum. The tentacular base is well developed, but the tentacle is rather short and slender, its filiform tip reaching very little beyond the palpi. The antennæ likewise have a filiform extremity. The tentacular and dorsal cirri agree in shape with the tentacle, but are longer. All have a few (*i.e.*, sparsely distributed) short clavate papillæ. The ventral cirrus reaches beyond the bars of the bristles, and is smooth. The ventral papilla has

the average development, rising from the posterior and outer angle of a prominent elevation, and in the preparations being directed between the feet, or upwards and outwards. The palpi are of moderate length and smooth. They taper rather quickly toward the filiform termination. The tail is completed by two long styles (cirri).

The scales amount to fifteen pairs, and are pale, slightly translucent and milky, and show thinly scattered small papillæ on their free surface, and a few clavate cilia along their posterior border (Pl. XVIII. fig. 2). The scar of attachment, in the anterior third of the body, is toward the anterior and outer region of the scale; posteriorly in the elongated scales it is more nearly central. The finely branched nerves are well seen. The first and second scales, as usual, show the papillæ very distinctly.

The feet are furnished with a much denser as well as a darker yellowish series of bristles than those of *Polyeunoa levis*, with which it was associated. The dorsal division has a series of stoutish bristles (Pl. VIIa. fig. 14) with well marked and rather broad, smooth tips, and close spinous rows. Such bristles are not round, but conspicuously angled, a feature best seen in the larger examples of the Polynoidæ. The group shows a definite arrangement of longer, straighter, and more pointed forms next the ventral series (*i.e.*, externally).

The ventral bristles superiorly possess rather long tips (Pl. VIIa. fig. 15, representing one of the larger forms) and distinct spinous rows. The bifid tip is less evident than in those from the middle of the series (Pl. VIIa. fig. 16). The secondary spur of the same tip is broad and strong, and the spinous rows in all the ventral bristles are very boldly marked. A minute *Loxosoma* with transversely striated stalk, and many Foraminifera, occurred amongst the bristles.

In one specimen fragments of a hydroid zoophyte, sponge-spicules, Diatoms, and Crustacean debris occupied the intestine.

There does not appear to be anything distinctive in the sections of this form, or of the other varieties of *Lagisca magellanica*.

Lagisca peracuta, n. sp. (Pl. IV. fig. 6; Pl. VIIa. figs. 10, 11).

Habitat.—Several specimens were dredged off St. Vincent, Cape Verde Islands, July 1873.

All the examples are incomplete, the longest measuring about 14 mm. in length and 4·5 mm. in breadth.

The flattened dorsum is somewhat regularly tesselated throughout with brownish markings, and a tinge of the same colour extends to the bases of the feet.

Toward the posterior third of those with the pigment well developed the segments

bearing cirri have the most conspicuous colouring. Thus within the elevated papilla on each side of the base of the foot is a rounded deep brown pigment-spot, then a pale streak, from which a broad band of brown proceeds to the central line, which is pale. A transverse pale line behind separates this from a median and two lateral pigment-touches. A somewhat symmetrically interrupted narrow band of brown marks the commencement of the next (scale-bearing) segment, the central region of which is occupied by an elongated area of brown, partially divided into three by two longitudinal pale bars, and surrounded by a large pale region. Behind are three dark brown touches similar to those in the preceding segment. The whole arrangement is both beautiful and symmetrical.

The pigment on the palpi is occasionally arranged in transverse bars along the inner border.

The head is pale, with four large eyes, all visible from the dorsum. Two are situated at the posterior border, and two (somewhat larger and considerably wider apart) in front of the lateral prominence. The tentacle is absent. The antennæ are filiform and rather long. The dorsal cirri and tentacular cirri are absent. The palpi have numerous and distinct papillæ. The ventral cirri reach considerably beyond the setigerous process of the foot, and have well-marked clavate papillæ. The ventral papillæ are similar to those in the former species.

The dorsal division of the foot bears moderately long bristles (Pl. VIIA. fig. 10), which have an elongated, smooth, spear-like portion at the tip, and very distinct rows of spines. The latter are, however, seldom so prominent as in the figure, which has been slightly turned round to expose them.

The ventral series consists superiorly of bristles with longer tips, which are bifid, though less conspicuously so than the next series (Pl. VIIA. fig. 11). In the latter the short tips are as distinctly bifid as in *Lagisca propinqua*, and the rows of spines are long and distinct. On the whole the terminal regions of the ventral bristles are short.

Unfortunately no scale was sufficiently preserved to show more than a series of minute papillæ.

The extruded proboscis presented the ordinary nine papillæ superiorly and inferiorly; and the maxillæ were light brownish in colour. As usual this organ is clasped posteriorly by a muscular sheath, consisting externally chiefly of circular muscular fibres, and internally of longitudinal fibres.

The cuticle seems to be somewhat thicker in the median line over the nerve-area, which is narrow. The nerve-cords in section are rounded. One is a female, containing in the perivisceral cavity many ova showing a granular yolk-mass, nucleus, and nucleolus.

This species approaches *Lagisca propinqua*, Mgrn., in the structure of the ventral bristles, but the tip of the dorsal quite differs both from this and *Lagisca jeffreysii*, M'I.

The eyes are also much larger than in the former species, and are all visible from the dorsum.

In many examples numerous adventitious bristles had penetrated the dorsum.

Lagisca (*Agnodice*) *moseleyi*, n. sp. (Pl. VI. fig. 6 ; Pl. Xa. figs. 7, 8).

Habitat.—Trawled at Station 106 (in the middle of the Atlantic, in the line of the tropics), August 25, 1873 ; lat. 1° 47′ N., long. 24° 26′ W.; depth, 1850 fathoms ; bottom temperature 36°·6, surface temperature 78°·8; Globigerina ooze.

A fragmentary specimen without scales and somewhat injured, as indeed most soft forms from deep water are. It is of considerable size, measuring 23 mm. in length and nearly 18 mm. in breadth, the bristles greatly increasing the diameter. The body is quite pale throughout, and seems to be in process of regeneration posteriorly.

The head (Pl. VI. fig. 6) is pale, with two somewhat ovoid whitish masses anteriorly, like bleached eyes, and posteriorly two paler rounded spots on each side of the middle line. The palpi are long, rather slender, and gently tapered from base to apex. They also show faint longitudinal striæ, and under a lens the sides are downy, from a dense series of somewhat long slender papillæ with very slightly bulbous tips. The proboscis has a little dark pigment internally, a feature of interest in connection with the external pallor.

The dorsal cirri are long, slender, and filiform distally, gently tapered from base to apex, and covered with long cilia, which extend far upward on the tip. The cilia have bulbous extremities. The tips of the cirri extend beyond the bristles on each side. The ventral cirri pass very considerably beyond the bases of the ventral bristles, are slender and tapered, and are covered with long cilia similar to the foregoing. The ventral papillæ project distinctly about the eighth foot, and are continued backwards as large and proportionally thick processes, which differ entirely from those of *Lepidonotus* and *Lagisca*.

All the bristles are of a very pale straw colour and remarkably long. The dorsal (Pl. Xa. fig. 7) are long, slender, and nearly straight, with the exception of a few of the upper and inner series. The length of the hispid region is characteristic, and the rows of spines very distinct, so that at first sight it resembles an *Evarne*. Below the spinous region the shaft is striated longitudinally, and the striæ continue upwards nearly to the tip. The latter is peculiar, being probe-pointed and slightly curved. Many have a blackish granular deposit of a parasitic nature placed at intervals on the shafts, so that they are moniliform under a lens.

The ventral bristles are likewise extremely long and slender. The shafts are finely striated, and a distinct dilatation occurs, as usual, where the serrations commence. The

spinous rows are so closely arranged (Pl. XA. fig. 8) that the whole surface is more or less hispid. The tip is acute and very slightly curved, no trace of a secondary process being visible in any.

The structure of the head is peculiar, and the bristles differ from those of *Lagisca*, though the simple tips of such as *Lagisca jeffreysii* are closely allied. A new genus will probably be necessary for its reception, after a complete example is obtained.

The intestine contained fragments of minute Crustacea, the stomachs of which seem to have been loaded with Diatoms, minute Foraminifera, and other organisms.

In transverse section the first feature is the thinness of the cuticle, which forms a mere film over the attenuated hypoderm in the median ventral line, where it usually is conspicuous. These layers thus form a very thin investment outside the nerve-trunks, which are of considerable size. The proboscis seems to be proportionally large in comparison with the thin walls of the body.

Lagisca crosetensis, n. sp. (Pl. VIII. fig. 6; Pl. XIII. fig. 2; Pl. XVIII. fig. 7; Pl. XIA. figs. 4–6).

Habitat.—Two specimens were procured by the trawl at Station 147 (near the Crozet Islands), December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms; bottom temperature 34°·2, surface 41°·0; Diatom ooze.

The form is characterised by the whitish papillose scales, the long palpi, the rapid diminution of the body posteriorly, and the length of the dorsal bristles. Many of the feet had been thrown off, probably on immersion in spirit, so that it is in all likelihood active and irritable.

The head has two rather distinct eyes at the posterior border and quite at the outer extremity. The anterior pair (which are considerably larger) occur on the lateral prominence. The tentacle is absent. The palpus is very long, and gradually tapered from base to point. It is quite smooth. The antennæ are long, slender, and finely attenuate at the tip. They are covered with long cilia with bulbous extremities, and some even extend upward on the delicate tip. The dorsal cirri are long and slender, with scarcely a noticeable enlargement below the filiform termination. They have similar cilia. The tips of the long, smooth, subulate ventral cirri extend considerably beyond the bases of the bristles. The ventral papilla shows slight development.

The whitish ovoid scales (Pl. XVIII. fig. 7) entirely cover the back, and indeed considerably overlap. The larger processes are visible under a lens, so that the scales appear slightly pilose. The whole scale is covered with spines, which commence anteriorly as very minute structures, but posteriorly form long and conspicuous conical processes. The posterior and outer borders are furnished with long and slender cilia.

The spines as usual are much developed in the first scale. Amongst the long conical thorns are a few slender cilia, which sometimes extend beyond the tips of the former. There are also some globular or blunt processes, which probably represent developing spines after injury.

The dorsal division of the foot has a series of very long, stiff, nearly straight and acutely pointed bristles with short though boldly marked spinous rows (Pl. XIA. fig. 4, one of the longer and more slender forms). They are tapered almost from the base, so that a very acute tip results. The rows of spines are also often visible on both sides. The smooth portion at the tip is very short, sharp, and slightly bent when seen from the front as in the figure. In the less numerous shorter forms (Pl. XIA. fig. 5, a lateral view) the tip is broader. The transverse lines are distinctly marked. These bristles are of a brownish tint.

The ventral division bears bristles which are much less conspicuous, both in thickness and length, than the dorsal. The superior have long serrated tips, the inferior short, and though in neither are the rows furnished with long spines, they have the peculiarly defined serratures observed in the dorsal, and which are best seen antero-posteriorly. In lateral views (Pl. XIA. fig. 6) the spinous rows are less distinct. The nature of the bifid tip is peculiar. Below the terminal hook is a short and very acute spine directed upward, and the smooth portion beneath is sometimes convex, as in the figure.

The cuticle is dense, especially in the ventral median line. The nerve-cords are of average size, and the area is moderate.

This species is easily distinguished from the known forms by the shape of the body and the length and structure of the dorsal bristles.

Lagisca yokohamiensis, n. sp. (Pl. XIA. figs. 12, 13).

Habitat.—Dredged off Yokohama, Japan, May 6, 1875, in 5 to 50 fathoms.

The single specimen unfortunately had been dried, so that only an imperfect description can be given.

The scales and dorsum are mottled all over with dark brownish pigment, and the head is especially dark, being in the specimen almost purplish-black. The eyes seem to have an arrangement similar to the ordinary examples of *Lagisca*. The tentacles, tentacular and dorsal cirri have numerous and somewhat long cilia, with a slightly bulbous tip. The palpi seem to be comparatively smooth, only a few short papillæ being visible here and there in the preparation. The scales are studded all over with small spines, and the posterior and outer borders have numerous and rather long cilia.

Both dorsal and ventral bristles are comparatively long. They are of a pale straw-colour. The dorsal division of the foot bears a series of bristles (Pl. XIA. fig. 12)

with a smooth, sharp point. The serrated rows are distinct, though the spines are not long.

The ventral branch has bristles with bifid tips and well-marked spinous rows (Pl. XIA. fig. 13, an average form). The secondary process forms an acute angle with the long axis of the hook at the tip; and the smooth portion between the latter and the commencement of the hispid rows is long.

This species somewhat approaches the *Polynoë* (? *Lænilla*) *lamellifera* of Marenzeller,[1] but it differs in the absence of the pear-shaped processes on the scales, which are also apparently less minutely spinous. The dorsal bristles of Marenzeller's form further do not show so long a smooth region at the tip, and the secondary process or spur of the inferior series has a different angle. Too much weight, however, should not be placed on the latter points, and but for the essential differences in the scales the two might have been united.

Lagisca darwini, n. sp. (*an Evarne juvenis*?) (Pl. VI. fig. 5; Pl. XIX. fig. 5; Pl. XIIA. figs. 1–3).

Habitat.—Trawled at Station 308 (in the Strait of Magellan), January 5, 1876; lat. 50° 8′ 30″ S., long. 74° 41′ W.; depth 175 fathoms, surface temperature 51°·7; blue mud.

Two minute specimens of this form occurred, and though neither is perfect, one had a few scales attached. The longest measures a little over 2 mm. with a breadth of about 1·2 mm. The examples appear to be immature.

The head (Pl. VI. fig. 5) is furnished with four very distinct eyes, two being placed posteriorly, and two over the lateral eminence, so as to be entirely on the dorsum. The palpi are comparatively large, and taper rather abruptly at the tip. The tentacle is a simple filiform process diminishing from base to apex. The antennæ have the same structure. All these processes have sparsely distributed clavate cilia. The ventral cirrus reaches beyond the base of the bristles.

The scales (Pl. XIX. fig. 5) are pellucid and delicate, the surface being covered with minute spines, and the edge with short clavate cilia.

Both dorsal and ventral bristles are translucent and proportionally attenuated. The dorsal division bears an elongated and boldly curved series with comparatively long spinous rows (Pl. XIIA. fig. 1, representing one of the longer forms). The smooth portion at the tip is simply pointed.

The ventral branch has also elongated translucent bristles with peculiar tips, those of the upper forms being obscurely bifid (Pl. XIIA. fig. 2), while the lower (Pl. XIIA.

[1] Südjapan. Annel., p. 7, Tab. i. fig. 5.

fig. 3) present tips that are almost simple as in *Evarne*. It is sometimes difficult to say what the exact structure of these tips is, for the bristles are small and extremely translucent. A slight projection occurs in some beneath the hook, as in the figure.

This form approaches *Evarne* both in the arrangement of the eyes and in the structure of the bristles.

The nerve-cords are comparatively large.

Eulagisca, n. gen.

Eulagisca corrientis, n. sp. (Pl. XIII. fig. 4; Pl. VIIa. figs. 3, 4).

Habitat.—A single specimen was trawled on hard ground at Station 320 (off the east coast of South America south of Buenos Ayres), February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom temperature 37°·2, surface temperature 67°·5; green sand.

A fragmentary example also occurred at Station 150 (between Kerguelen and Heard Islands), February 2, 1874; lat. 52° 4′ S., long 71° 22′ E.; depth, 150 fathoms; bottom temperature 35°·2, surface temperature 37°·5; coarse gravel. The feet of the specimen, however, showed Globigerina ooze. Length about 38 mm.; breadth of the widest part, including bristles, 15 mm. This fragmentary example was evidently larger.

The body is characteristically narrowed posteriorly as commonly seen in *Lagisca* and *Evarne*. The dorsum is barred and flecked with brown, and there is a dark brown patch on the papilla for the scale and its homologue on the other feet.

The head (Pl. XIII. fig. 4) has the pointed anterior processes tipped with brown, and the basal portion of the tentacle (which is absent) of the same colour. The eyes are remarkably large, the second pair being situated at the margin of the head posteriorly, and each has a lenticular whitish opacity in the centre. The anterior pair occupy the projecting lateral region, and are only partially visible from the dorsum. A similar central whitish opacity is present. From the large size of the organs those of each side are separated by a very narrow interval. The antennæ and tentacular cirri are absent. A single palpus showed rather elongated acute papillæ on its surface. Just in the middle line beneath the insertions of the tentacles and between the bases of the palpi is a short conical process, marking the central part of the superior oral arch, which is slightly bent upward at this point. A brown band leads from the centre of the roof upward to this process, which is also brownish, and at each side is a dark brown pigment-mass. This subtentacular cirrus is remarkable.

The dorsal cirri show a scarcely appreciable enlargement below the filiform tip. Their surface has numerous elongated slender cilia with a distinctly bulbous extremity.

A pale protoplasmic mass is frequently observed to issue from the torn bases of these cirri. Stretching through this mass are granular lines which at intervals dilate into what appear to be ganglion-cells (with granules and nuclei). It is not yet known whether these are hypodermic or nervous elements. The ventral cirri show a marked constriction above the basal enlargement, and the majority have indeed separated at this point. They are rather slender, reach a little beyond the bases of the bristles, and have a few somewhat short clavate papillæ on their surfaces. The ventral papilla is largely developed, especially towards the middle of the body. It appears as a considerale process on the fifth foot (sixth if that bearing the tentacular cirri be calculated). A ridge of skin runs inwards from the base of the papilla nearly to the ventral groove.

The fragmentary example from Station 150 fortunately carried two somewhat

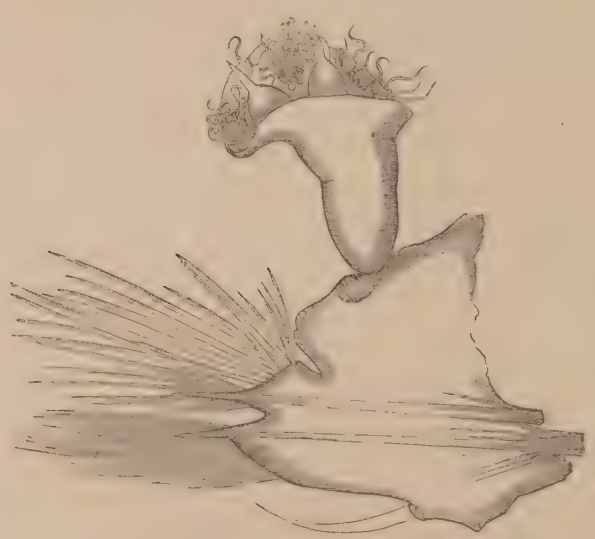


Fig. 1.—Remarkable parasitic structure on the twenty-first foot of *Eulagisca corrientis*.

oblong scales. These are comparatively small, have their surface flecked with pale brownish touches, are comparatively smooth over the greater part of the area, and have a few long clavate cilia at the posterior border.

The dorsal branch of the foot bears a series of long pale bristles of somewhat uniform diameter and with wide rows of short spikes (Pl. VIIa. fig. 3, one of the intermediate or average forms). The tip is bare for a short distance, and the dorsal curve of the bristle is more pronounced than the ventral. By transmitted light the tips are slightly opaque, apparently from increased density, the rest of the bristle being translucent. The first foot (bearing the tentacular cirri) has its dorsal bristles directed forward.

The ventral bristles are all attenuated and translucent, the upper series having very

long and faintly bifid tips. The latter gradually diminish in length from above downward (Pl. VIIa. fig. 4, one from the middle of the series). A faint opacity by transmitted light also occurs from the commencement of the spinous region at the tip downward. These bristles come nearest to those of *Lagisca*.

In the intestine were greyish-brown masses of cells and granules.

Attached to the twenty-first left foot is a curious pedunculated organism that at first sight presented the appearance of a minute white *Lucernaria*. The peduncle is somewhat short and wide, and terminates inferiorly in a small sucker-like body having a curved lateral process like a hook, which loosened with a jerk when the structure was detached from the foot. The peduncle gradually dilates upward into a broad and somewhat thin expansion or disk, which has its upper surface furnished with a series of filiform tentacles. In the centre of these are two remarkable pear-shaped firm bodies fixed by a broad base (indicated externally in each case by a scar), their pointed ends projecting freely upward. The total height of the structure is 2·5 mm., and the breadth of the disk 2 mm. The peduncle is eccentric in position, the scars of the two hard bodies appearing on the larger or external moiety of the disk (see woodcut 1).

The bristles are allied to those of *Lagisca*, while the eyes, scales, and ventral papillæ diverge. The subtentacular cirrus is unique, and is akin to the proboscidian process in the Acœtidæ (*Eupompe* and *Panthalis*). In transverse section both cuticle and hypoderm appear to be very thin, so that the ventral area forms a mere band. The nerve-cords are small and much flattened.

Lagisca (?) *kermadecensis*, n. sp. (Pl. XIII. fig. 8; Pl. XIIa. figs. 4–6).

Habitat.—Trawled at Station 170 (a little north of the Kermadec Islands), July 14, 1874; lat. 29° 55′ S., long. 178° 14′ W.; depth, 520 fathoms; bottom temperature 43°·0, surface temperature 65°·0; volcanic mud.

A fragmentary example of a small species, measuring about 5 mm. in length and 2·5 mm. in breadth.

The head bears four brownish eyes; the two smaller occupying the sides of the head posteriorly, and the two larger being situated on each lateral eminence, and only partially visible from the dorsum. The tentacle is absent, but its basal region is tinted dark grey. The other cephalic appendages are also absent. The ventral cirrus is a simple tapering process, its tip extending far beyond the base of the bristles, and even beyond the spine.

In structure the feet somewhat resemble those of *Evarne* or *Lagisca*, but are distinguished by a remarkable cristate lobe above the spine of the inferior setigerous region.

The dorsal division of the foot bears a series of rather large translucent bristles (Pl. XIIA. fig. 4) with very short tips and boldly marked spinous rows. The latter indeed very much resemble those in *Evarne impar*, though the bristle itself is less tapered.

The ventral bristles have very short tips, with a simple terminal hook. The spinous region is elongated, especially superiorly (Pl. XIIA. fig. 5). The hispid rows, indeed, in the superior bristles approach so near the hook that their spines project slightly beyond it, or at any rate quite as far (Pl. XIIA. fig. 6), a feature best observed in an antero-posterior view. Some of the tips seem to be slightly bifid, a character rendered less evident than usual by the length of the spines.

No scales are present.

The spinous condition of the tips of the ventral bristles resembles that of Sars's *Lænilla mollis*,[1] from Drobach and Lofoten; though the organs perhaps are less setose. The forms are somewhat allied.

Lagisca (?) *hexactinellidæ*, n. sp. (Pl. IV. fig. 5; Pl. XIIA. figs. 14–16).

Habitat.—Procured in the Hexactinellid sponge containing *Syllis ramosa* at Station 209 (near Zebu, one of the Philippines), January 22, 1875; lat. 10° 14′ N., long. 123° 54′ E.; depth, 95 fathoms; bottom temperature 71°·0, surface temperature 81°·0; blue mud.

A minute species, quite pale, and measuring in its somewhat imperfect condition about 5 mm. in length, and including the bristles fully 2 mm. in breadth.

The head (Pl. IV. fig. 5) is characterised by the presence of four very distinct brownish eyes. The first pair occupy the lateral region about the middle of the head, while the second occur at its posterior border. The palpi are somewhat short, smooth, and attenuated at the tip. The antennæ, tentacular and dorsal cirri are all smooth, tapering processes. The latter (dorsal cirri) have slender filiform tips. The ventral cirri are subulate and smooth, the extremities reaching considerably beyond the setigerous lobe of the foot.

The scales are translucent, slightly milky structures, perfectly smooth all round the margin, and by transmitted light only showing a few distinct processes between the scar for attachment and the anterior border. The whole area is covered by branching nerve-fibres issuing from the scar. The scales are proportionally large, and appear to overlap in the middle line of the dorsum.

When fully formed the foot bears dorsally a very long cirrus, which tapers in a filiform manner from base to apex. If folded backward, the organ, throughout the anterior

[1] Bidrag til Kundskaben om Christianiafjordens Fauna, iii., 1873, p. 7, Tab. 14.

third of the body, stretches over about seven successive feet, and thus its length is a marked feature. The setigerous dorsal lobe of the foot is feebly developed, and projects so slightly that the tips of its bristles pass little beyond the bases of the ventral bristles. The dorsal bristles are translucent and somewhat slender, having fine serrations along the edge, and a peculiar tip (Pl. XIIa. fig. 14, one of the shorter dorsal forms) which gives an indication of the bifid condition present in the ventral series.

The ventral is the chief setigerous lobe, and forms a well-marked cone in an antero-posterior view. The bristles are also translucent and somewhat slender, and the tips are distinctly bifid. The serrated region is long in the superior bristles (Pl. XIIa. fig. 15), and shorter and broader in the inferior (fig. 16). The terminal hook is strongly curved, while the secondary process beneath stands outward at a wide angle to the long axis of the bristle.

The larger example is a female, and probably only the pair existed in the sponge. The translucency of both this commensalistic form and the *Syllis* is noteworthy. The specimen is not in a good state for minute examination, but in transverse section the typical structure exists. The ventral area is almost wholly occupied by the large rounded nerve-cords. The comparatively large ova are grouped chiefly at the bases of the feet.

Harmothoë, Kinberg.

Harmothoë benthaliana, n. sp. (Pl. XIII. fig. 3 ; Pl. XX. fig. 7 ; Pl. Xa. figs. 9, 10).

Habitat.—Two specimens were dredged off the American coast at Station 45, May 3, 1873 ; lat. 38° 34′ N., long. 72° 10′ W.; depth, 1240 fathoms ; bottom temperature 37°·2, surface temperature 49°·5 ; blue mud. It was accompanied by several peculiar types in other divisions of the invertebrates.

The head (Pl. XIII. fig. 3) is pale and appears to be devoid of eyes, but in the larger specimen four very minute eyes are present ; the posterior situated within the posterior border and at the outer corner, the anterior, on the lateral eminence about the middle of the head. There is thus no possibility of confounding this form with *Harmothoë imbricata*, the eyes in which, besides, are very much larger. The tentacle is a simple tapering process, somewhat shorter than the palpi, and the tentacular and long dorsal cirri have a similar shape with very attenuate extremities. All these have clavate cilia. The palpi are rather long and gently tapered, as well as apparently smooth. The ventral cirrus is glabrous and proportionally large and long, the tip reaching the extremity of the elongated inferior lobe. The scales are pellucid and pale (Pl. XX. fig. 7), a few long and somewhat conical papillæ being visible at the posterior border,

while numerous short spines occur near the point of attachment which lies toward the anterior margin.

A glance at a foot in profile shows the essential distinction between this form and *Harmothoë imbricata*, irrespective of the condition of the cirri already alluded to. While in the latter the dorsal and ventral bristles are fairly balanced in regard to size, those of the new form are not so, the ventral much exceeding the dorsal tuft. The inferior division of the foot, moreover, in *Harmothoë benthaliana* bears a large flattened and somewhat lanceolate lobe projecting far outward.

The dorsal division of the foot carries a group of rather long boldly curved bristles (Pl. Xa. fig. 9), finely serrated and with peculiarly flattened tips which have a "knife-edge" aspect on the convex side. The edge, moreover, shows a slight curve in the middle, and the shaft of the bristle is striated. There is no marked distinction between the longer forms externally (next the ventral in a lateral view) and the shorter next the body.

The ventral bristles consist superiorly of a few slender forms with elongated spinous regions and a distinctly bifid tip, and a conspicuous series of much stronger bristles beneath (Pl. Xa. fig. 10, which represents an average form). The great proportional size of the latter is characteristic. The tip is boldly hooked, and a minute secondary process occurs below. From the latter to the commencement of the serrated region a peculiar flattening (knife-edge) of the smooth portion exists, and the outline is slightly convex.

In transverse section the chief feature is the comparatively large size of the nerve-cords.

Harmothoë haliaëti, M'Intosh.

Harmothoë haliaëti, M'Intosh, Trans. Zool. Soc. Lond., vol. ix. pt. vii. p. 384, pl. lxix. figs. 7, 8, 9, and 10.

Habitat.—Dredged in the Færöe Channel by H.M.S. "Knight Errant" at Station 3, August 3 and 4, 1880, in 53 fathoms.

The capture of complete examples of this form enables the description already given to be supplemented, since only a fragment of the posterior end of the Annelid was dredged by Dr. Gwyn Jeffreys in his yacht "Osprey" in the Minch. It is satisfactory to find that the data relied on in the case of the fragment have withstood further tests.

One specimen measures in length about 18 mm., with a breadth of 6·5 mm. from the tips of the bristles; but from the appearance of other fragments this is rather a small example. Unfortunately the rest had been dried.

The head somewhat resembles that of *Lagisca*, having a pair of well marked and

widely separated eyes posteriorly, and a larger pair situated on the anterior lateral prominence. The tentacle is absent. The antennæ are subulate and brownish, with a filamentous tip. The dorsal cirri have a characteristic fusiform appearance, from the gradual nature of the dilatation and the long filiform tip. They are sparsely covered with clavate cilia which in length barely attain three-fourths the diameter of the thickest part of the cirrus. The ventral cirri are rather slender and small, and also possess a few short clavate cilia.

The scales seem to be fifteen pairs. The smaller first pair are rounded, and studded with tubercles and minute spines. The latter occur along the anterior border, while the larger are scattered over the outer and posterior areas, in the form of low blunt processes, five or six along the posterior border being very large. The scales are thin and translucent, and thus show all the markings clearly. The border is quite smooth throughout. The scales from the middle of the body have the greater part of the surface covered with small tubercles, while the isolated large blunt conical forms occur within the posterior border and neighbourhood, a few intermediate kinds being situated within the outer border. The scales are mottled with touches of brown, best marked round the area of attachment.

The brownish pigment of the dorsum of the body posteriorly is very prettily arranged in lozenges and touches, as often seen in species of *Lagisca*.

Evarne, Malmgren.

Evarne kerguelensis, n. sp. (Pl. VI. fig. 4; Pl. XIX. fig. 6; Pl. VIA. figs. 12–14).

Habitat.—One example was procured by the dredge at Station 149E (Kerguelen Island, off Greenland Harbour), January 21, 1874; lat. 49° 37′ S., long. 70° 16′ E.; depth, 30 fathoms; volcanic mud.

Many others were obtained amongst the bristles of *Lætmonice producta*, dredged off Christmas Harbour in the same region, January 29, 1874; depth, 127 fathoms.

This new form, when compared with the well-known *Evarne impar*, Johnston, from Europe, is smaller, and the feet and bristles are proportionally shorter, thus giving the body to the naked eye a firmer appearance and more defined outline. The brown pigment of the dorsum (after removal of the scales) is also in a large and more uniform transverse bar in each segment. The length of the larger form is about 13 mm. and the breadth about 4 mm., whereas a good example of the British *Evarne impar* measures from 18 to 20 mm., and has a transverse diameter of 7 or 8 mm.

The head has considerably smaller eyes than *Evarne impar*, but they hold the same position. The tentacle shows more evident cilia, a feature, however, only apparent, and due to the presence of parasitic growths. The organ has a longer filiform tip than

Evarne impar, and the cilia are somewhat shorter and less bulbous at the extremity. These cilia are often rendered downy under the lens by the development of large numbers of stalked Infusoria on them. The basal division of the tentacle is brownish, and further the lower part of the distal region is similarly tinted. There is also a little brownish pigment below the filiform tip as usual in such forms. In *Evarne impar* the base of the tentacle is often pale in the spirit-preparations. The ventral cirri also differ from those of the latter in being smooth.

On contrasting the scales of the two forms a marked difference is caused by the absence, in the new form (Pl. XIX. fig. 6), of the conspicuous soft papillæ which are so prominent in *Evarne impar* along the posterior border. In the first scale of the present form the greater part of the margin shows short cilia, those on the anterior and outer borders, however, being proportionally longer than in the former species. The surface is covered with very much larger and more isolated truncated spines than in *Evarne impar*, though the scale is smaller. Moreover, in place of the large bulbous papillæ toward the posterior border of the scale in the latter there are only a few bluntly conical papillæ. In *Evarne impar* the first scale has a dense mass of cilia along the outer and anterior borders, a few longer and larger than in the previous form; the posterior margin is on the whole smooth, while the inner has short cilia. The whole surface is densely covered with short spinous papillæ (but though the scale is larger these are much less than in *Evarne kerguelensis*), and toward the posterior border internally are two large globular pedicled papillæ, besides one or two on the outer side. The bulbous heads of the two large processes show small secondary papillæ. No other scale remained attached in the new form, but in those gathered amongst the debris it was evident that a dense series of much longer cilia than in *Evarne impar* existed along the outer border, and that such gradually diminished along the posterior border. The few and large spinous papillæ over the surface distinguish them from the densely spinous scales of *Evarne impar*, which, moreover, possess the large pedicled globular papillæ posteriorly.

The bristles, as indicated, are considerably shorter than in *Evarne impar*. The dorsal have the rows of spines less distant, and the tip is on the whole more slender (Pl. VIA. fig. 12). All the dorsal bristles, indeed, are somewhat more slender and pointed than in the British form.

The ventral bristles, again, have shorter tips, even the superior (Pl. VIA. fig. 13) in most cases showing no trace of a secondary process at the tip. Such occur, however, in a few. The shorter series from the middle of the tuft (Pl. VIA. fig. 14), as well as the inferior group, are also devoid of a secondary process.

In the intestine were fragments of small Crustacea, pieces of sponge, broken tests of Radiolaria, and other debris.

Externally numerous Infusoria (*Acineta*-forms and others) occur on the bristles along with confervoid growths.

In transverse sections of the body-wall the cuticle is well developed ventrally. The nerve-area is of moderate breadth, and the cords of a flattened ovoid shape. The strong oblique muscles are attached to the upper and outer border of the area. Some of the examples carried ova in the perivisceral cavity.

Evarne tenuisetis, n. sp. (Pl. IXA. figs. 10–12).

Habitat.—Procured by the trawl at Station VI. (in the Atlantic off the south coast of Spain, westward from the Strait of Gibraltar), January 30, 1873; lat. 36° 23′ N., long. 11° 18′ W.; depth, 1525 fathoms; bottom temperature 36°·0, surface temperature 58°·0; Globigerina ooze.

The specimen is fragmentary and much injured, so that only an imperfect description can be attained. The upper and other parts of the head had been destroyed. It is a species of considerable size, probably between 20 and 30 mm. in length, and having a diameter from tip to tip of the ventral bristles of 10 mm.

The palpi are very long and attenuate. There is no trace of dorsal cirri, but what remain of the ventral seem to be long and filiform, stretching considerably beyond the bases of the bristles.

The great length and attenuation of the feet and bristles in proportion to the size of the body are characteristic features. Each foot with its bristles is about twice the breadth of the body. The bristles throughout are pale yellowish or golden. Those of the dorsal branch are very long, slender, and tapering, the finely attenuate tips having different curves when viewed laterally (or in other words slightly hooked, Pl. IXA. fig. 10), so that the type of the ventral is maintained. The rows of spines are widely separated as in *Evarne*, and extend far downward, so that the spinous region is much elongated.

The ventral division has superiorly bristles (Pl. IXA. fig. 11) which approach the dorsal series in their attenuate condition, very slightly hooked tips and great length of the spinous region, though of course they are much more slender proportionally than the dorsal bristles. Proceeding downwards the shafts increase in strength, the spinous regions become shorter, and the tips (Pl. IXA. fig. 12) more distinctly hooked,—all these characters being best marked in those at the ventral border.

Evarne johnstoni, M'Intosh.

Evarne johnstoni, M'Intosh, Trans. Zool. Soc. Lond., vol. ix. pt. vii. p. 398, pl. lxxi. figs. 13–18.

Habitat.—Dredged in the Færöe Channel by H.M.S. "Knight Errant" at Station 5, August 11, 1880, in 515 fathoms; bottom temperature 45°·5, surface temperature 56°·6:

ooze. A fragment of the anterior region measuring about 4 mm. in length and 3·5 mm. across the bristles. It is therefore about the same size as that dredged in the "Porcupine" in the Atlantic (Station 3) in 1870. It seems to be active and irritable. All the scales are likewise absent.

Lænilla, Malmgren.

Lænilla fusca, n. sp. (Pl. XIV. fig. 3; Pl. VIIIA. figs. 12, 13).

Habitat.—Trawled at Station 320 (in the Atlantic, off the mouth of the La Plata), February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom temperature 37°·2, surface temperature 67°·5; sea-bottom composed of green sand. It occurred along with Polyzoa, *Terebella*, *Hyalinœcia*, and Foraminifera.

A fragment consisting of 11 mm. of the anterior region of the body only was procured. The greatest breadth is about 14 mm. inclusive of the ventral bristles, which extend outward on each side fully half the breadth of the body. The dorsum is of a rich purplish-brown hue, the surface for the attachment of the scales alone remaining pale in the preparation. The colour becomes less intense on the bases of the feet. Inferiorly the tint is paler, especially on the feet. The body of this species seems to be fragile.

The head is mainly distinguished by the peculiar condition and great disparity in regard to the size of the eyes. It is pale, with the exception of a faint madder-brown blush behind the anterior peaks, and the median brown bar running backward from the tentacular region, and therefore is in marked contrast with the deep purplish-brown body. A pair of small eyes occur at the posterior border, at each side, and almost touching the fold of the body. Besides the black pigment internally there would seem to be a pale or greyish region externally. The whole area, however, is much less than in the anterior eyes. The latter occupy the lateral prominences, and are only partially visible from the dorsum; indeed their appearance varies according to the angle of inspection. Each consists of a large greyish circular area having superiorly a deep black spot about the size of the posterior eye in the centre with a black pigment-band running anteriorly and posteriorly. When viewed from above, the transparent surface of the eye gives a characteristic lustre to the lateral aspect. A line drawn transversely through the middle of the head would pass somewhat in front of their central axes. The tentacle is absent. Its basal region is brownish, and the bar formerly alluded to runs backward therefrom. The antennæ are simple subulate organs. The tentacular and dorsal cirri show a very slight enlargement below the tip, and have sparsely distributed short clavate papillæ on their surfaces. The tips of the papillæ (cilia) are in many cases almost globular, from a slight constriction of the neck of the process. The palpi are

absent. The ventral cirrus is a tapering subulate process extending about as far outward as the setigerous lobe of the foot. It has a few clavate papillæ. Both it and the dorsal are readily detached. The ventral papilla is a small process directed between the feet.

The dorsal division of the foot has a series of rather long dull yellowish bristles, the outer, or those nearest the ventral, being very long and attenuate; indeed, with the exception of the short forms, all possess a much tapered and rather straight terminal region, so that the bristles (Pl. VIIIA. fig. 12, an intermediate one) are comparatively slender and translucent. The rows of spines are fairly developed.

The ventral branch carries a dense group of slender bristles with attenuate spinous tips, the latter being bifid, though superiorly and inferiorly this feature is not very evident. The secondary process is minute and nearly in the long axis of the bristle (Pl. VIIIA. fig. 13, representing an average example). They are semitranslucent, and for the size of the species are very delicate.

The body seems to be loaded with male reproductive elements, and the proboscis projects posteriorly from the fragment.

Transverse section demonstrates that the dark pigment invades the entire hypoderm and forms a thick layer on the dorsal arch of the body, especially at the outer border of the dorsal longitudinal muscle. The nerve-cords are large and rounded, resting below on the hypoderm, and bounded internally (*i.e.*, dorsally) by connective tissue. In the section the ventral area (containing the cords) projects considerably, so that a horizontal line opposite the oblique muscles would leave them external. The hypoderm within the chitinous lining of the proboscis is as deeply tinted with pigment as that surrounding the body, and consequently the nerve-cords of the organ (which abut on the muscular layer) are unusually conspicuous.

The *Hermadion fuligineum* of Dr. Baird, from the Antarctic Expedition, is an allied form probably referable to the same genus, and diverging from *Hermadion* proper. The position of the eyes, which are situated quite differently, and the structure of the ventral bristles, which are much more elongate, at once discriminate the species. The same blackish-brown body characterises both. In another preparation, while the position of the eyes remains the same, the inferior ventral bristles are somewhat shorter.

Eupolynoë, M'Intosh.

Eupolynoë mollis, M'Intosh.

Eupolynoë mollis, M'Intosh, Ann. and Mag. Nat. Hist. ser. 4, xvii. p. 319, 1876.
Polynoë mollis (M'I.), Grube, Annelidenausbeute von S.H.S. "Gazelle," p. 513.
Eupolynoë mollis, Transit of Venus Exped., Phil. Trans., extra vol., 1879, p. 259, pl. xv. figs. 5–9.

Habitat.—A fragment of the anterior end occurred at Station 149 (Royal Sound, Kerguelen), January 18, 1874; depth, 100 fathoms.

The complete state of the head enables the description formerly given to be supplemented. The tentacle is a long slightly brownish process, having just below the tip a darker brown band. The enlargement below the extremity both in this and the cirri—which have the same colour—is so slight that it could hardly be recognised. These processes have sparsely distributed short clavate cilia. The brownish palpi are of average length and quite smooth.

In this specimen the scales are very thin, but they present no trace of the gelatiniform conditions observed in those of *Halosydna gelatinosa*, Sars. The colour of the scale is faintly brownish, with a pale border externally, and a lighter spot toward the point of attachment. The brownish pigment is best seen on the under surface of the scale. The somewhat circular first scale has a pale border all round and a pale patch in the centre. The right (first) scale is superior.

The ventral papilla is well marked as a prominent cylindrical process on the fifth bristled foot. In some a small soft mass projected from the tip as if a granular substance had exuded. The process extends farther outward than usual on the foot.

The ventral area is of considerable length, and the nerve-cords much flattened. The cuticle separates very readily from the hypoderm.

Allmaniella,[1] n. gen.

Allmaniella setubalensis, n. sp. (Pl. XIV. fig. 2; Pl. Xa. figs. 3, 4).

Habitat.—Procured by the dredge at Station II. (off Setubal), January 13, 1873; lat. 38° 10′ N., long. 9° 14′ W.; depth, 470 fathoms; surface temperature 57°·0; green mud.

The anterior fragment of a minute species measuring about 3 mm. in length. The breadth from tip to tip of the ventral bristles is about the same. It is characterised by its large eyes, peculiar shape of the head, and the remarkable structure of the ventral bristles, which show bifid points terminally, and then some distance beneath another distinct point inaugurates the spinous rows. The dorsum is reddish-brown, and the ventral surface is of the same hue but somewhat paler.

The shape of the head (Pl. XIV. fig. 2) is peculiar, since the tentacle lies nearly in the centre, and from this a furrow is continued backward to the neck. The head is thus divided into two well-marked lobes. Only the basal region of the tentacle is present. Two large eyes are situated on the dorsal aspect of the head posteriorly, and wide apart. Each has a central white speck. Two others occupy a lateral position opposite the tentacle. The latter are much larger, and also have a central whitish area. The head

[1] The genus is named in honour of Prof. Allman, F.R.S.

terminates on each side anteriorly in an elongated bluntly conical process bearing at its tip an organ like an antenna, the surface of which has clavate cilia. The brownish terminal appendage is slightly enlarged at the base and tapers to a filiform tip. A cicatrix appeared to be present on each side beneath, and to this a palpus may have been attached. Such traces of the dorsal and tentacular cirri as remain show that these organs also had sparsely distributed clavate cilia. The ventral cirrus is long, tapering, and apparently smooth. It is peculiar in having a number of rounded granular cells internally. All the scales are absent.

The dorsal division of the foot bears two series (which, however, run into one another) of translucent bristles with well-developed spinous rows and boldly marked longitudinal striæ. Those next the body are shorter, broader, more curved, and more abruptly pointed (Pl. Xa. fig. 3); moreover, the longitudinal striæ are crossed by close transverse striæ, which thus make the hispid region minutely checkered. The outer series (next the ventral) are straighter, longer, and proportionally more slender than the former, and their spinous rows are longer.

The ventral group has superiorly slender bristles with elongated spinous regions, and terminated by long peculiarly curved smooth tips, which are slightly bifid. Toward the middle of the series the structure of the latter is better shown (Pl. Xa. fig. 4). The spinous rows end superiorly at a well-marked process, and the curve of the long smooth region below the bifid tip is characteristic. The inferior setigerous lobe is produced into a long conical process, with the spine at the apex.

Théel[1] describes a new genus (*Bylgia*) from the Kara Sea in which the small antennæ are the only organs on the anterior margin of the head, but the tentacle is entirely absent, and the form of the head and the structure of the bristles diverge much from the foregoing. The nerve-cords, as in similar small forms, are proportionally large and rounded.

Scalisetosus, n. gen.

Scalisetosus ceramensis, n. sp. (Pl. Xa. figs. 13, 14).

Habitat.—Trawled at Station 194a (south of the island of Ceram), September 29, 1874; lat. 4° 31′ S., long. 129° 57′ 20″ E.; depth, 360 fathoms; surface temperature, 82°·5; volcanic mud.

The single specimen is devoid of scales, and seems to have been partially dried. Length 16 mm. and breadth about 6 mm. An imperfect description only can be attempted.

[1] Annél. Polychètes d. mers. d. la Nouvelle-Zemble, *K. Svensk. Vetensk. Akad. Handl.*, Bd. xvi., No. 3, Stockholm, 1879, p. 20, pl. i. fig. 13, &c.

The genus is characterised by the condition of the scales, which do not cover the dorsum, and by the structure of the bristles.

The body is somewhat flattened and elongate, and in the preparation devoid of pigment. The head is much injured, and all that can be said is that the anterior peaks are unusually distinct and firm, and that there are traces of ocular pigment posteriorly and laterally. The palpi are short and smooth; and the antennæ are also smooth. Neither dorsal nor tentacular cirrus is present. The ventral cirrus is a smooth tapering process like the antenna, and reaches beyond the bases of the bristles. The ventral papilla is very distinct from the fourth or fifth bristled segment backward. It is a small slightly tapered process, and is carried on the inner edge of the foot. Claparède made the interesting observation that in his *Hermadion fragile* (a closely allied form) this organ opens by a ciliated canal into the interior of the foot near the reproductive masses.

The bristles are pale, translucent, and of moderate length. The dorsal group is made up of translucent bristles with but three or four, and in one or two of the shorter forms, five prominent though somewhat blunt spines to represent the rows usually seen in such structures (Pl. Xa. fig. 13, which represents one of the thicker long forms in which the spines are less developed than in the shorter kinds). In a few of these bristles a thin ridge runs from each side of the spine, apparently the homologue of the spinous row.

The ventral tuft consists of rather long and large translucent bristles, the superior having elongated and more distinctly spinous tips, the inferior shorter and broader tips (Pl. Xa. fig. 14). The termination is somewhat strongly hooked, and beneath is a distinct though small secondary process. The spinous rows are numerous and close. The inferior setigerous lobe slopes acutely upward to the prominent cone containing the spine superiorly.

Both sets of bristles are peculiarly translucent, and after preservation in calcium chloride numerous granules occur toward the base of the hollow shaft.

The longitudinal ventral muscles present a well-marked inferior convexity in section. The ventral area is of considerable width, but the cords are flattened and indistinct. The cuticle and hypoderm are both very attenuate. Ova of various sizes occur in the perivisceral chamber, so that the specimen is a female.

Claparède[1] thought his *Hermadion fragile* (the *Polynoë pellucida* of Ehlers) was closely allied to Kinberg's *Hermadion magalhaensi*, especially as the scales did not cover the dorsum; but a minute examination of all the characters shows that there is very little in common, while on the other hand the structure of the foregoing and other allied forms demonstrates the necessity for instituting a new genus. The *Polynoë longicirra* of Schmarda,[2] from the southern shores of Ceylon, resembles this group in the

[1] Annél. Chétop., p. 72.

[2] Neue wirbell. Thiere, I. ii. p. 152, Tab. xxxvi. fig. 309.

structure of the dorsal bristles, but his figures are so indefinite that no opinion can be expressed concerning the ventral.

Hermadion, Kinberg.

Hermadion kerguelensis, n. sp. (Pl. XI. fig. 5; Pl. XII. fig. 1).

Hermadion longicirratum, Kinberg, Baird, Proc. Linn. Soc. Lond., vol. viii. p. 196.
Hermadion longicirratus, Kinberg, M'Intosh, Transit of Venus Exped., p. 258, pl. xv. figs. 1–4.

Habitat.—Many specimens of this large species were dredged at Station 149, off Kerguelen Islands, January 9, 1874; lat. 49° 8′ S., long. 70° 12′ E.; Accessible Bay; depth, 20 fathoms; volcanic mud. Also at Station 149B, off Royal Sound, Kerguelen, January 17, 1874; lat. 49° 28′ S., long. 70° 30′ E.; depth, 25 fathoms; surface temperature, 40°·5; volcanic mud. Station 149C, Balfour Bay, Royal Sound, Kerguelen, January 19, 1874; lat. 49° 32′ S., long. 70° 0′ E.; depth 60 fathoms; volcanic mud; large numbers. Port William, Falkland Islands, in 5 to 10 fathoms.

This is one of the largest of the Polynoidæ, specimens measuring upwards of 80 mm. in length and about 30 mm. (inclusive of the bristles) in breadth.

The body is elongated and narrowed posteriorly, the greatest transverse diameter occurring a little behind the anterior third. It is not much flattened. The number of bristled segments ranges from forty-two to forty-five.

The head (Pl. XI. fig. 5) is comparatively small, devoid of the anterior peaks on each side, and in the preparations the eyes are somewhat indistinct. Two are situated laterally just in front of the nuchal fold, and two on the anterior region, the latter being only partially seen from the dorsum. They are most distinct in young specimens.

The basal portion of the tentacle is much developed, and the column has the usual enlargement below the filiform tip. The tentacle is pale beyond the basal region, then becomes tinted towards the enlarged part—the latter and the filiform tip being pale. A series of short clavate cilia are sparsely scattered over its surface with the exception of the filiform termination. It is interesting to observe that the basal processes of such structures are never furnished with papillæ or cilia, whereas the distal parts are so very frequently. The former would seem to belong to the same system as the cuticular surface in the neighbourhood. The bases of the antennæ are considerably below the tentacle, and thus the appearances materially differ from those in *Lepidonotus* in which, likewise, there are no anterior peaks. The antennæ are like the tentacle on a smaller scale; and the tentacular and dorsal cirri are similar. The palpi are brownish, of average length, and pointed at the tip. Minute cilia with the ends truncate rather than clavate occur on their surface, from a little above the base almost to the tip.

The dorsal cirri commence on the second bristled foot, then on the fifth, and on every alternate foot to the twenty-third. The latter has one, and so has the twenty-fourth; the twenty-fifth is blank. They then occur on the twenty-sixth, twenty-seventh, twenty-ninth, thirtieth, thirty-second, thirty-third, and every succeeding one to the forty-seventh. The tail is represented by a long and large cirrus of a similar character in the middle line below the anus, a peculiarity—if it were constant, which it is not—of considerable importance in regard to classification. The dorsal cirri of several of the last feet are longer than those in front.

The first ventral cirrus (on the first bristle-bearing foot) corresponds in structure and appearance to the dorsal cirri; and the others behind are somewhat longer than their successors. The latter also lose the clavate papillæ on their surface. Toward the tail, on the other hand, the papillæ again appear, and on the penultimate segment the organ resembles the anterior dorsal cirri. The average ventral cirrus is a short tapering process which reaches the bases of the ventral bristles. The ventral papilla is well developed, occurring on an eminence at the base of each foot. It has the form of a slightly tapered truncate cone.

The scales are fifteen on each side, the four anterior pairs only meeting in the middle line, those which follow leaving a considerable portion of the dorsum bare. Two or three of the terminal pairs, however, again meet in the preparations. The first occurs on the second foot (first bristled), the second on the fourth, the third on the fifth, the fourth on the seventh, and so on alternately to the twenty-third. The thirteenth scale is placed on the twenty-sixth, the fourteenth on the twenty-ninth, and the fifteenth on the thirty-second foot. To the naked eye the scales are smooth, but they are really covered all over with minute spines (Transit of Venus Exped., pl. xv. fig. 1). The spines have in most cases a somewhat truncate tip. In section the scale is comparatively thin. The external margin is slightly curved upward in many. The scales in young forms almost entirely cover the dorsum, except the bare part at the tail.

The foot consists of two well-marked divisions, and each has dorsally an inner tubercle for a scale, or a cirrus projects from the posterior part of the bristle-papilla, as in the previous families. It is interesting thus to notice the uniformity in regard to the arrangement of the processes. The bristles form a prominent border of a light brown colour along the sides, the dorsal being somewhat darker than the ventral. They are rigid, and easily penetrate the hand if pressure be made against them. The dorsal bristles are comparatively few in number, and radiate stiffly outward from a conical papilla (*op. cit.*, pl. xv. figs. 2, 3). They increase in length toward the posterior end of the body. The spine of this division is black.

The ventral bristles are in two groups, an upper smaller, situated rather above and behind the spine, and a large dense series placed in transverse rows below the spine.

The superior group consists of stout bristles; the inferior as usual diminishes in

strength from above downward (*op. cit.*, pl. xv. fig. 4, one from the middle of the latter series).

The proboscis forms a laterally compressed tube occupying the middle line of the anterior third of the animal. The mouth leads by a wide muscular gullet into this chamber. When extruded there are nine papillæ superiorly, and nine inferiorly. Four short teeth guard the aperture.

Externally the organ is invested by a transparent finely fibrous layer, which, after reaching half way backward on each side, converges to a muscular slip which is inserted into the middle of the posterior boss. Such a slip would pull on the latter, probably in connection with the passage of a bolus. The whole canal is marked by evident transverse striæ, caused by intersecting fibrous bands which enclose the vertical muscular fibres as it were with a loose parallel network, and which run continuously round the organ, intersected, however, at each lateral region by a line of the same nature running from front to back. These transverse bands are highly elastic, the fibres adhering together much more closely than the vertical fibres forming the main mass of the proboscis. This adhesion appears to be due to the granular sarcolemma. The function of this peculiar arrangement seems to be analogous to that of the reticulated layer in the Nemertean proboscis.

In transverse section the proboscis shows externally the well-marked fibrous investment, which is densest at the two poles; then a series of radiate fibres which make up the bulk of the organ, and pass from without inward to the thin basement-layer beneath. These elastic fibres, as ordinarily seen, are parallel, and readily separated from each other. They are also smooth throughout, when isolated. In mass, however, they often present a peculiar wavy appearance, a feature most marked externally. Circular fibres occur here and there externally in the sections, so that they would appear to be present in most forms, though much more largely developed in some than others. The cap or external investment of each pole is formed of a layer differentiated from the rest. Externally is a coat of elastic tissue, then a stratum of thick zig-zag and probably elastic fibres which in thin transverse sections are continuous from side to side. In dilatation of the proboscis this elastic coat will probably be quite straight; in the ordinary position in retraction it assumes a zig-zag condition. Beneath the basement-layer just mentioned is a considerable glandular and fibrous covering, apparently the homologue of the hypoderm. It is composed for the most part of fan-shaped groups of fibres spreading from a granular and glandular base toward the innermost coat of the organ. This forms a small conical fold, projecting inward, at each pole. The inner layer is firm, chitinous, and translucent.

The ventral area is large and well defined, and the nerve-cords are rounded or ovoid. The hypodermic area is somewhat spindle-shaped, beginning by a narrow end under each longitudinal ventral muscle, and assuming considerable depth in the median line. The cuticle is of moderate thickness.

The proboscis ends in a prominent puckered *os* which projects into the commencement of the capacious glandular intestine in the ordinary state of the parts. The latter canal contains in many cases elongated firm greyish masses of mud with sponge-spicules, Diatoms, fragments of Crustacean cuticle, and other debris.

The same whitish parasitic structure is found in this form as described in *Nychia cirrosa* from Holsteinborg.[1]

The excellent condition of the specimens procured in the Challenger Expedition enables a more perfect estimate to be formed of the structure and relations of this form. It evidently differs from any species described by Kinberg. The structure of the head, scales, bristles, and the frequent presence of the long median caudal cirrus, are characteristic. It is true Malmgren attributes a median caudal style to *Polynoë scolopendrina*, Sav., but such is of little moment so far as this well-known form is concerned, for it has two short caudal styles, as usual in the group. The head agrees somewhat closely with that in the species last mentioned. The occurrence of a single median caudal style is a peculiarity in certain examples; others show a pair, and one or two a larger and a smaller. The nearest of the three species described by Kinberg from the Strait of Magellan is *Hermadion magalhænsi*, which closely resembles the present form in regard to the structure of the ventral bristles, and there may be some ambiguity in his remark that the dorsal bristles and cirri are smooth. The coarsely granular scales and the divergent dorsal and ventral bristles readily distinguish his *Hermadion longicirratus*, just as the bifid ventral bristles separate his *Polynoë antarctica*. In the British Museum are numerous specimens which had been referred by Dr. Baird to Kinberg's species, as I also did formerly. The localities have been indicated by Dr. Baird. The latter author's *Hermadion ferox* appears to be one of the Palmyraceæ allied to his *Hermione chrysocoma*.

Polynoë, Savigny.

Polynoë (*Langerhansia*) *euplectellæ*, n. sp. (Pl. XV. fig. 6; Pl. XIX. fig. 7; Pl. IXA. figs. 8, 9).

Habitat.—Dredged in *Euplectella* at Station 209 (off the Philippines), January 22, 1875; lat. 10° 14′ N., long. 123° 54′ E.; depth, 95 fathoms; bottom temperature 71°·0, surface temperature 81°·0; blue mud. Various remarkable Sponges, Gephyreans, and Molluscs occurred on the same ground.

The species is very fragile and translucent, apparently not well adapted for other than commensalistic life. Its length is about 21 mm. and breadth 7 mm.

The body is long, narrow, and flattened, slightly tapered in front of the anterior third, and more so posteriorly. It is pale throughout.

[1] *Proc. Roy. Soc. Lond.*, vol. xxv. p. 216, 1877.

The head (Pl. XV. fig. 6) has two prominent and somewhat rounded lateral lobes which end bluntly in front. Two rather small eyes are situated, widely apart, at the posterior border, and two on the lateral region—behind the middle line—the pairs on each side being thus approximated. The anterior pair are only partially seen from the dorsum. The tentacle is a smooth gently-tapered process about the length of the palpi. The antennæ and cirri are likewise smooth. The dorsal cirri have finely attenuated extremities, and present numerous granular cells, apparently in connection with fine radiating fibres, as well as the central axis. The palpi are rather short, gently tapered, smooth processes. The slender ventral cirrus reaches beyond the bases of the bristles, and has a filiform tip. The ventral papilla is minute.

The scales have a slightly opalescent or milky appearance, are translucent, and under a high power are minutely granular. Only a few short translucent papillæ occur along the free border (Pl. XIX. fig. 7). From the scar of attachment fine branching fibres radiate outward. They seem to number about eighteen or twenty pairs, and to cover the dorsum completely.

The feet are comparatively long, and in some are so translucent as to show large nucleated cells rolling in their anterior. The bristles are pale. Those of the dorsal branch are elongated, and have a slightly bent smooth tip (Pl. IXA. fig. 8). The rows of spines are both closely arranged and minute, so that at first sight the bristle seems merely marked by transverse lines. Very few bristles surpass these in the delicacy of the spinous rows.

The ventral bristles are quite as pale and translucent, and their tips are very finely serrated, the rows of spines being so minute toward the hooked tip that they are with difficulty distinguished (Pl. IXA. fig. 9, representing an intermediate form). The superior group possesses very much longer and more attenuated, and the inferior much shorter tips than the specimen figured. The close similarity in the facies of both dorsal and ventral bristles is interesting.

This Annelid is not mentioned by Capt. Chimmo as a "parasite" of *Euplectella*.[1] Commensalism, however, is frequent in the family.

In the transverse section of a female the ova are comparatively large, and form conspicuous organs in the perivisceral cavity. The nerve-cords are flattened.

Polynoë (?) *ascidioides*, n. sp. (Pl. XXXIIA. figs. 3–5).

Habitat.—Found by Prof. Herdman inside the branchial chamber of an Ascidian, trawled at Station 160 (south of Australia), March 13, 1874; lat. 42° 42′ S., long. 134° 10′ E.; depth 2600 fathoms; bottom temperature 33°·9, surface temperature 55°·0; red clay.

Only a single injured example occurred, its total length being about 14 mm., and its

[1] On Euplectella aspergillum, 4to, London, 1878.

greatest breadth 2 mm. If the bristles be included in the latter then it is nearly 8 mm., so long are the feet and these organs.

This form somewhat approaches *Macellicephala mirabilis*, from Station 269. The body is narrow and elongate, delicate and semi-translucent in the preparation, and with very long feet and bristles. The proboscis and intestine are quite visible from the exterior; and posteriorly large nucleated cells are observed in the upper lateral regions. The mouth forms a well-marked aperture surrounded by puckered edges on the under surface of the buccal segment. The anus is terminal and prominent. A cirrus is probably attached to a small papilla on each side (between the anus and the large cirrus).

The head is rather rounded, with a pale elevation on each side of the tentacle, as if from a large pale eye. The large whitish opacity in the middle of each may represent ocular pigment. The origin of the tentacle is peculiar, being nearly in the middle of the head. It is elongate and filiform, gently tapered from base to apex. A pair of very minute filaments (one in front of each eye) may represent antennæ. The organs apparently corresponding to the palpi are considerably shorter than the tentacle, have a somewhat falciform outline, with a tapering tip. The tentacular cirri have the same shape as the tentacle, and appear slightly jointed under a lens, perhaps from imperfect preservation. The dorsal cirri are borne on the feet at a considerable distance from the body, and their slender tips project beyond the most prominent bristles. The last pair present in the preparation (only a papilla without a ventral cirrus intervening between each, and the anus) are much larger than the others, and appear to be articulated at the base. The ventral cirrus is a simple tapering slender process. All these organs are smooth. The ventral papilla forms only an elevation.

The scales seem to amount to nine pairs, and are all comparatively small and semi-translucent. The first pair occur on the first feet, and are so small as to form little round lamellæ, about the diameter of the feet. They are supported on a pedicle. The next two pairs occur as usual on the third and fourth pairs of feet, and are gradationally larger. The succeeding scales are on alternate feet, and three are nearly equal in size. Thereafter they diminish toward the tail, the last (on the terminal foot), however, being larger than the first. All are pedicled. The scales are delicate, translucent smooth structures with an opaque patch over the pedicle, from which a series of bifurcating nerves radiate to the margin. From their position the scales project more over the bases of the feet than over the dorsum, and in the majority they do not touch each other on the same side, and are separated by a wide interval from their fellows of the opposite side. In shape the larger have the antero-posterior diameter longer than the transverse.

When viewed from above the feet are elongate, an enlargement occurring just within the tapering tip. Viewed antero-posteriorly, the foot presents an outline not unlike that in the Hesionidæ, at least in the shape of the distal part. Toward the base dorsally is

the pedicle of the scale (the active region in which regeneration of the latter occurs). This is situated somewhat nearer the body than the pedicle of the cirrus in those feet bearing such. Beyond is the dorsal bristle-papilla placed at the anterior border of the foot, which is also separated by a larger interval from the scale-peduncle than from the basal region of the cirrus. From the lower part of the division an acute process, ensheathing the spine, projects outward and forward, the latter direction also being followed by the fascicle of long slender pale bristles. These are slightly narrowed at the base, dilate upward and again diminish toward the tip, which has the usual curve backward (Pl. XXXIIa. fig. 3). The distal region shows indications of the usual spinous rows in the form of lateral serrations having a whorled disposition, so that the lateral notches seem alternate.

Beyond the dorsal setigerous process and the ventral cirrus, which in antero-posterior views are nearly opposite, the outline of the foot is somewhat lanceolate, the long pointed apex being formed by the spine and its investment. All the bristles are extremely elongate and translucent, those above the spine (in lateral view) presenting a dilated or probe-pointed tip (Pl. XXXIIa. fig. 4), with very fine serrations of the ordinary kind beneath, the latter being closer and more distinct than in the dorsal bristles. The shafts are slightly narrower than the tips. Below the spine the extremities of the upper forms are also probe-pointed, but they are broader, and thus more boldly distinguished from the shaft. Toward the inferior border, again, there are several with even broader and shorter tips, which are pointed, and the serrations on the edge are closer (Pl. XXXIIa. fig. 5).

The specimen is in an indifferent condition, but so far as can be seen the ventral area is remarkably short; indeed, the oblique muscles meet in the middle line, and in section the large rounded nerve-cords lie beneath.

Polynoë platycirrus, n. sp. (Pl. III. fig. 4; Pl. XVI. fig. 2; Pl. XIX. fig. 3; Pl. VIIIa. figs. 14, 15; Pl. IXa. fig. 1).

Habitat.—Dredged sparingly at Station 162 (off East Moncœur Island, Bass Strait), April 2, 1874; lat. 39° 10′ S., long. 146° 37′ E.; depth, 38 fathoms; surface temperature, 63°·2; sea-bottom, sand and shells.

A pale fragment also occurred at Station 163, April 4, 1874; lat. 36° 57′ S., long. 150° 34′ E.; depth, 2200 fathoms; bottom temperature 34°·5, surface temperature 72°·0; sea-bottom, green mud. Trawled likewise at Station 163a (off Twofold Bay, Australia); lat. 36° 59′ S., long. 150° 20′ E.; in 120 to 150 fathoms; surface temperature, 71°·0; green mud.

The length of the largest example is about 45 mm., and its total breadth nearly 10 mm.

The body is elongated and flattened, tapered slightly anteriorly and more so posteriorly. It is specially characterised by its great flattened lancet-like cirri, and the peculiar striated brownish scales.

The head is shaped somewhat like that in *Lepidonotus*, with the bases of the antennæ elevated dorsally and nearly on a level with the same part of the tentacle. Two smaller eyes are placed quite at the margin posteriorly, and a much larger one on each lateral eminence. A small lens-like whitish speck occurs in the middle of each of the former, and a similar structure lies toward the anterior part of the latter, being thus eccentric in position and probably connected with anterior vision. The base of the tentacle is large, and tapers little distally; while the column of the organ is longer than the palpi, and nearly of uniform diameter, though rather larger at the distal than the proximal end. A filiform process occurs distally. The antennæ are of considerable length and similar in shape. Their filiform terminations almost reach the tips of the palpi. The tentacular cirri agree in shape with the tentacle, being very slightly increased in diameter from base to tip. The anterior dorsal cirri are similar, but they soon assume a flattened, broadly fusiform or lancet-shape below the filiform process, till near the posterior end of the body, when they become more slender distally. A symmetrical pair terminate the body. All are quite smooth. The palpi are comparatively short, finely tapered at the tip, and also smooth. There is a short cylindrical process in the median line dorsally, over the oral aperture, as in certain other forms (*e.g.*, *Eulagisca corrientis*, p. 91) and as indicated by the rounded boss in *Lepidonotus squamatus*. The ventral cirrus is a subulate tapering organ, reaching nearly to the base of the bristles. The ventral papilla is a well-marked cylindrical process, slightly enlarged below the tip as in *Lepidonotus*. It is, however, considerably shorter than the latter.

The scales are about twenty-three pairs. They are somewhat ovoid (Pl. XIX. fig. 3) and comparatively smooth, a region along the outer border, however, having a series of closely arranged minute blunt tubercles rather than spines. The scar of attachment is outside the median line, and is indicated on the scale by a pale spot. The latter, in the last scale, is near the anterior border, which is inflected. The rest of the surface of the scale is pale brown, with four darker longitudinal belts which join those of the preceding and succeeding scales, so that the four stripes are continuous from head to tail, the outer pair having the pale area of attachment between them. In vertical section the thickest part of the scale seems to be at or rather around the scar of attachment, and it tapers conspicuously in its inward progress, less so externally. The dorsal cuticle of the scale is thicker than the ventral. The intermediate hypodermic layer is comparatively thin and firm.

The dorsal division of the foot is very little developed, being represented only by a small papilla, from which the spine does not protrude. On one side of the papilla are a few minute bristles (Pl. IXA. fig. 1), the shorter forms are probably homologous with those occurring near the body in the ordinary types, while the longer example with a tapering extremity probably indicates an average specimen. The spinous rows are well marked. The bristles of this branch of the foot somewhat resemble such imperfectly developed kinds as are found in *Harmothoë marphysæ*.

The ventral region of the foot forms in antero-posterior view a broad process, the extremity sloping from the rounded tip downward and backward. The dull yellowish bristles have long straight shafts with comparatively short tips, which are boldly bifid after the manner of *Harmothoë marphysæ*. The bifurcation (Pl. VIIIA. fig. 14) shows a stout terminal or main division, and a well developed inferior one, the spinous rows beneath being proportionately large, and resembling those of *Lepidasthenia*, as is apparent in the antero-posterior view (Pl. VIIIA. fig. 15) of one of the same group, viz., the longer forms toward the upper part of the division.

The larger specimen had a considerable quantity of pale brownish ova attached to the dorsal surface of the posterior feet, extending beyond as well as elevating the scale-margins.

The cuticle of the body, especially that of the ventral surface, is remarkably thick; indeed it is considerably thicker than the hypoderm of the same region even in the middle line. The area between the oblique muscles is well marked, and the somewhat ovoid nerve-cords are distinct. They are bounded internally by a firm investment of connective tissue. In one example a few ova occurred in the perivisceral cavity. The structure of the body-wall is clearly defined and firm.

In transverse section (*in situ*) the proboscis shows a deep median longitudinal groove externally, situated somewhat nearer the dorsal than the ventral pole. Such is by no means common in the group.

The striped condition of this species is interesting in connection with the prevalence of conspicuously striped leeches in the fresh waters of Australia.

The foregoing form appears to be closely connected with the *Lepidonotus striatus* of Kinberg,[1] who found an imperfect specimen off Port Jackson, Australia, with thirteen pairs of scales. His figure, however, indicates that the anterior eyes are dorsal in position, and they are considerably smaller than in the examples from the Challenger. He does not refer to the peculiar condition of the dorsal cirri, and the outline of the foot is somewhat different, especially in the slope of the distal margin and in the brevity of the ventral cirrus. His figures of the bristles are also more or less at variance, and he appears to have selected one of the shortest dorsal forms. It is possible, however, that many of these differences are due to his artist. There is little in the description of Grube's *Polynoë fulvovittata*,[2] from Pandanon in the Philippines, to distinguish it either from the Challenger form or Kinberg's. It is true he speaks of eighteen scales only, but then his specimen was imperfect posteriorly. On the other hand, his figure of the scale is identical even to the occurrence of the scar of attachment between the two outer brown bands. He thinks the species approaches *Halosydna*. The *Polynoë australis* of Schmarda,[3] from Port Jackson, likewise comes near *Polynoë platycirrus* in the structure of the bristles, but the author does not mention the condition of the scales.

[1] Freg. Eugen. Resa, &c., p. 14, Tab. iv. fig. 18.
[2] Annel. Fauna der Philippinen, p. 33, Tab. iv. fig. 1.
[3] Neue wirbell. Thiere, I. ii. p. 154.

The *Lepidonotus stellatus* of Dr. Baird,[1] from the Australian seas, is apparently similar. The scales have a V-shaped arrangement of tubercles, the open end of the V being posterior. The lucid dots alluded to by Dr. Baird are probably hypodermic, and by transmitted light are arranged very prettily in groups. The dorsal bristles seem to be better developed in Dr. Baird's species, being larger and more numerous, but the ventral approach those of the present form closely, though the tips are not identical. No stripes appear, moreover, externally, only the V-shaped mark of the scales. Another allied Annelid, lately collected by H.M.S. "Alert" in the same regions, shows two parallel longitudinal (to the axis of the body) ridges toward the outer border of the scale.

The division of the Polynoidæ to which these various forms belong seems to be confined to the Australian seas.

Polynoë capensis, n. sp. (Pl. IV. fig. 4; Pl. XV. fig. 1; Pl. XIX. fig. 4; Pl. IXA. figs. 4, 5).

Habitat.—Two examples were dredged at Station 141 (near the Cape of Good Hope), December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms; bottom temperature 49°·5, surface temperature 66°·5; green sand.

Length about 25 mm., and breadth nearly 9 mm.

The body is rather elongated and narrow, and when the scales are present is tinted a dull blackish-grey. On removal of the latter organs the centre of the back throughout the greater part of the body is pale, but a little granular pigment occurs on the dorsum of each foot. Posteriorly also the last six or seven segments show in each a broad bar of pigment in front and a narrow one behind, rather regularly disposed. A little pigment is present on the same region ventrally, and on the bases of the feet generally.

The head (Pl. IV. fig. 4) is somewhat elongated from before backward, and, as in *Lepidonotus*, there are no prominent anterior peaks, the frontal edges running into the bases of the antennæ, which are conspicuous on the sides of the tentacle. Two rather small eyes are situated at the posterior border, and two larger in front of the lateral prominences. The pairs are thus wide apart, and somewhat like those of *Polynoë scolopendrina*. The tentacle is absent in both, but a loose organ probably represents it. This is somewhat fusiform, narrowed a little at the base, and tapered at the pale tip. It is blackish-grey in colour. The antennæ are also blackish-grey, and tapered from base to apex. The tentacular and dorsal cirri have a tendency to assume a fusiform condition. The basal region of each is dark greyish, the column blackish-grey, and the slightly tapered tip pale. All are rather short and smooth. The ventral cirri are long and large,

[1] *Journ. Linn. Soc. Lond.*, vol. viii. p. 185.

the extremities reaching far beyond the bases of the bristles. They are smooth, dark greyish at the base, from which they taper to the pale tip. The ventral papilla is a slightly tapered process, proportionally smaller than in *Lepidonotus*. The tumid region from which it arises is slightly tinted with the greyish pigment posteriorly.

The ovoid scales appear to be fifteen in number on each side, and have the exposed parts of a dull blackish-grey, and as the boundary line of the pigment is nearly straight, the pale anterior or covered region is sharply defined. They are quite smooth, with the exception of a triangular group of blunt tubercles near the anterior notch.

The dorsal branch of the somewhat short foot bears a series of feebly developed pale bristles, which under a lens sometimes resemble minute zoophytes, from the growth of a large thecate Infusorian. They have (Pl. IXA. fig. 4, which represents a short and broad form in profile) a short and peculiarly curved tip, and very fine rows of spikes along the margin, especially prominent toward the extremity.

The ventral division (which is acutely pointed superiorly) carries equally pale bristles with a well-marked hook at the tip (Pl. IXA. fig. 5, an intermediate form), and a small but well-defined secondary process beneath. The superior group possesses longer spinous rows, but a less distinct hook, the latter being best developed in the inferior series. The middle bristles, again, have the spinous rows faintly marked.

The head quite differs from that of *Halosydna* as well as from *Lepidonotus*, but it is more closely allied to the latter. The bristles, again, approach those of the former.

Polynoë pustulata, n. sp. (Pl. X. fig. 3; Pl. XVII. fig. 2; Pl. IXA. figs. 6, 7).

Habitat.—Two specimens were procured between tide-marks at Bermuda.

A somewhat elongated species, the larger though incomplete example measuring 38 mm. in length and nearly 8 mm. between the tips of the bristles.

The dorsum shows a little blackish pigment in the middle line, usually arranged, after the anterior third, in two somewhat lozenge-shaped patches in each segment. The ventral surface is quite pale.

The head is similar to that in *Lepidonotus*, having the antennæ developed on a level with and on each side of the base of the tentacle. Two somewhat small eyes are situated at the posterior border, externally, and between them is a conical nuchal projection. The anterior pair are placed on the lateral prominence, and are slightly larger. In the smaller example there is a considerable amount of pigment developed on the head. The tentacle is longer than the palpi, and has a swollen extremity, with a filiform process. The antennæ are also of considerable length, their filiform tips extending beyond the palpi in one specimen, but these comparative lengths are not much to be relied on except in carefully preserved animals. The palpi have peculiar papillæ on their surface, the base

of each (papilla) being a bluntly conical process, to which a filiform extremity is attached. The smooth dorsal cirri have a well-marked blackish belt a little below the pale extremity. The ventral cirrus is short and slightly tapered. It does not reach the bases of the bristles. The ventral papilla is somewhat clavate, its nearest ally in this respect being *Lepidonotus clava.*

There are eighteen pairs of blackish-grey ovoid scales (Pl. XVII. fig. 2), variegated with a white patch over the surface of attachment, a somewhat pale external border (a continuation of the pale anterior covered portion), and a series of very distinct tubercles which resemble pustules. The posterior scales are considerably smaller, but the isolated tubercles are larger. In vertical section the thick dorsal cuticle of the scales is peculiarly wrinkled or facetted, a feature probably due to the tuberculated condition. On the external border of the scale are a series of small conical papillæ, about three appearing in each transverse section just within the tip.

The bristles of the dorsal division of the foot are very slightly developed, forming a small tuft projecting outward at the tip of the strong spine. The bristles (Pl. IXA. fig. 6) have stout basal portions and very finely attenuated tips, with well-marked rows of spines, somewhat like those of *Polynoë platycirrus.* The shorter forms possess blunt extremities, but even more boldly marked spinous rows.

The ventral series consist of pale straw-coloured bristles, characterised by very short extremities. The shaft (Pl. IXA. fig. 7) dilates gradually from the insertion towards the tip, which presents the stout appearance of such as *Lepidonotus squamatus,* but further has beneath the terminal hook a very characteristic secondary process and ridge; while the spinous rows are largely developed. The nerve-area is small, the ovoid cords placed close together in section, and with a median space beneath. The cuticle is very dense.

In the intestine of the smaller example was a little whitish debris which contained fragments of Radiolaria, minute Crustacea, and a large series of the dorsal paleæ and bristles of a *Chrysopetalum,* or a form allied to *Bhawania myrialepis,* Schmarda.

This form closely approaches *Lepidonotus.* Dr. Baird's *Lepidonotus oculatus,*[1] from the Australian seas, presents a pustular condition of the anterior scales, but the organ in the preparations is pale, with the exception of a black spot over the surface of attachment, and the structure of both dorsal and ventral bristles materially diverges. The latter are simple, not bifid at the tip.

Polynoë (*Lepidonotus*) *iphionoides,* n. sp. (Pl. X. figs. 1, 2; Pl. XA. figs. 1, 2).

Habitat.—A single example was procured by the trawl at Station 201 (in Basilian Strait off the Philippine Islands), October 26, 1874; lat. 7° 3′ N., long. 121° 48′ E.; depth, 82 fathoms; surface temperature, 83°·0; stones and gravel.

[1] *Journ. Linn. Soc. Lond.,* vol. viii. p. 184.

A remarkably short ovoid form, characterised by the closely approximated eyes, the greatly developed palpi, and the structure of the bristles. Its length is 32 mm., and its breadth, inclusive of the bristles, about 20 mm. There are twenty-six bristled feet, the bases of which are bifid on the dorsal aspect.

The head (Pl. X. fig. 2) is by no means large, but is characterised by the great size and juxtaposition of the pairs of eyes on each side, indeed, the posterior pair project so far outward that in certain views they seem almost to overlap the other pair. Both occupy the lateral eminence, which in this form is placed far back. The posterior pair have a pale area (lens) in the centre, a feature also present at the front edge of the anterior pair. The latter look downward and forward, the former outward and upward. The tentacle is considerably longer than the palpi, and is somewhat slender and attenuate, with a marked enlargement (having some madder-brown pigment) below the filiform tip. The antennæ arise nearly on a level with the foregoing from the frontal edge as in *Lepidonotus*, and extend to the terminal third of the palpi. They also show the enlargement below the filiform tip. The palpi are large and inflated, and are densely papillose. The tentacular and dorsal cirri extend to the tips of the bristles and are quite smooth. The enlargement below the tip is marked in each case with a madder-brown ring. A noteworthy feature of the superior cirri is the remarkable dorsal swelling of the basal process, which gives a character to this region of the body. The ventral cirri are somewhat stout, the finely tapered tip extending a little beyond the bases of the bristles. The ventral papilla forms a well-marked nipple-shaped process.

The fleshy part of the foot is largely developed, and since the bristles are also of considerable length, the body acquires great proportional breadth in outline. The dorsal division of the foot carries a series of rather slender pale yellow translucent bristles with acute tips and somewhat straight shafts (Pl. Xa. fig. 1). The smooth distal portion is flattened, or even slightly concave on the serrated side of the bristle, and the rows of spines are short and fine, and therefore in marked contrast to those of the ventral series.

The ventral branch bears somewhat delicate and translucent bristles with very long spinous rows, the tips in some cases being almost feathery (Pl. Xa. fig. 2, which represents one of the upper or longer forms). The tip is simple and distinctly hooked. The long hispid rows resemble those on the bristles of *Iphione*, hence the derivation of the specific appellation. They rapidly diminish inferiorly.

No scales are present, but the scars show that twelve occur on each side, as in *Lepidonotus*.

The intestine contained fragments of small Crustacea and calcareous grains of various kinds. The proboscidian teeth are pale brown (amber coloured).

In transverse section the cuticle on the ventral surface is thick, while the hypoderm is very thin, even in the median ventral area. The nerve-cords are some-

what flattened. The reproductive elements (male) are present in the bases of the feet.

This form differs from any known genus.

Polynoë magnipalpa, n. sp. (Pl. XIII. fig. 6; Pl. XIV. figs. 1, 6; Pl. XVIII. fig. 5; Pl. Xa. figs. 5, 6).

Habitat.—Trawled at Station 171 (a little north of the Kermadec Islands), July 15, 1874; lat. 28° 33′ S., long. 177° 50′ W.; depth, 600 fathoms; bottom temperature 39°·5, surface temperature 66°·5; hard ground.

The length of the male is 17 mm. and its breadth about 4·5 mm. The females measure about 8 mm., and have a breadth of 4 mm.

In the female (Pl. XIV. fig. 6), which was that first noticed, the body is short (almost elongate ovoid in outline) and the palpi conspicuously large.

The head in the same sex (Pl. XIII. fig. 6) is somewhat short in antero-posterior diameter, and wide transversely. Two large black eyes are placed at the posterior border and wide apart, and two larger with pale centres occur on the prominent lateral region, and therefore little removed from the former. The tentacle is absent, but it arose from the anterior border of the head. The antennæ are short and subulate, and are widely separated from the tentacle, springing just under the slight anterior peak of the head. The palpi are proportionally large, much dilated in the middle, but finely tapered at the tip. They appear to be nearly smooth, a few translucent and slender papillæ only appearing along the edges. The dorsal cirri in several instances present remarkably tumid columns, the tips being finely tapered. Others are simple tapering organs like the tentacular cirri. They also show a very few short clavate papillæ on their surface. The ventral cirrus is somewhat longer than in the male, and its filiform tip extends beyond the bases of the bristles. The enlargement from which the ventral papilla springs is much more conspicuous than in the other sex.

The scales (Pl. XVIII. fig. 5) are thin, pale, and somewhat translucent, the anterior being minutely spinous over nearly the whole area, a few short clavate cilia appearing along the posterior border. The posterior, again, are minutely granular, with a few short clavate papillæ along the free border. Within the scale are a number of branched gland-like structures resembling fragments of granular vermicelli. These are especially conspicuous just inside the margin. Moreover, the surface of the scale has minute black grains. The scales almost entirely cover the dorsum.

The feet of the female are smaller (for the entire animal is less) than those of the male, but their general configuration corresponds. The dorsal branch bears a tuft of pale bristles of two kinds, those next the ventral being rather attenuate and long, with well-

marked spinous rows, those toward the body being shorter and more curved (Pl. Xa. fig. 5, an intermediate example).

The ventral group consists of bifid bristles with somewhat short tips (Pl. Xa. fig. 6, an average example), the usual gradational series occurring from above downward (*i.e.*, the longest and most slender tips being superior). They are faintly straw-coloured and translucent, and have a finely attenuate secondary process which passes nearly straight outward. The rows of spines are only well-marked superiorly and inferiorly.

A large number of ova occurred posteriorly on the dorsal aspect of the feet, under the scales.

The male (Pl. XIV. fig. 1) differs considerably in outline, being longer, and cylindrical rather than ovoid; the body is larger, and the scales leave the middle of the dorsum uncovered from head to tail. The arrangement of the eyes, however, is very similar, the pale lenticular region of the large anterior eyes in both being toward the front, as if vision were most useful in that direction. The scales seem to number about fifteen or sixteen on each side, and are much more opaque than in the female. Their structure, however, is similar, and especially the peculiar granular vermiform bodies. The scar for their attachment is large. The pedicle for the first scale is very prominent in both sexes. In the male the enlargement which is present in several dorsal cirri of the anterior third (Pl. XIV. fig. 1) is mainly a ventral development, forming a kind of dependent lobe containing a granular substance below the cirrus proper. These enlarged cirri seem to be arranged alternately with the ordinary tapering forms (like the tentacular cirri), and they are shorter. The ventral cirrus is on the whole shorter and thicker at the base than in the female. The ventral papilla is similar. The dorsal bristles appear to be somewhat shorter than in the female, and this is an interesting feature in regard to the ovigerous character of the dorsum of the foot. In intimate structure both dorsal and ventral bristles agree with those of the other sex.

In the intestine of the male were the translucent chitinous plates and long hairs of a minute Crustacean and a few fragments of Algæ. The teeth are pale brownish, and the appearance of the proboscis and its papillæ corresponds with that generally observed.

This form approaches *Harmothoë*, though the dilatation of the dorsal cirri is characteristic.

In minute anatomy the sexes differ slightly. The oblique muscles in both proceed to the upper and external part of the nerve-area, which is very limited. The cords in the male are flattened, and protected externally by a very thin layer of hypoderm, and a thick layer of cuticle, which, however, diminishes over the median ventral area. The male elements fill the perivisceral cavity and its ramifications.

In the female the nerve-area seems to be more limited, and the cords less flattened. The oblique muscles also appear to approach each other somewhat more closely above this region.

Polynoë attenuata, n. sp. (Pl. XV. fig. 2; Pl. XX. fig. 9; Pl. XIA. figs. 8, 9).

Habitat.—Found between tide-marks at Sea Point near Cape Town, along with *Terebella*, *Sabella*, and *Sabellaria*, and from its great length and general appearance it would seem to be a commensalistic form, probably with the first mentioned.

The length of the single specimen is about 55 mm., and the breadth, including the bristles, about 6·5 mm.

The body is comparatively long and narrow, and the dorsum has a considerable amount of blackish pigment (anteriorly arranged in transverse bars) from end to end, the region behind the scales being beautifully marked with symmetrical touches. Moreover, the three rows (two lateral and a median) of prominent papillæ are in connection with the pattern, the lateral being pale while the median is dark. The ventral surface is quite pale anteriorly, but posteriorly each segment has some dark greyish pigment over the swelling for the ventral papilla, and between the patches of opposite sides is a somewhat linear arrangement of pigment-grains. Each segment, moreover, has a long lozenge of pigment on each side of the median pale band.

The head is somewhat dusky, with two eyes of moderate size placed near the posterior border a short distance within the margin, and two (of larger size), as in *Polynoë scolopendrina*, Sav., and *Harmothoë*, just below the peaks of the head in front. The tentacle arises from a large base, which fills up the space between the peaks. The column is comparatively thick, and slightly dilated below the filiform tip. It is brownish and freckled with the pale cilia which densely coat its surface and make a strong contrast with the same organ in *Polynoë scolopendrina*. The dilatation and filiform tip are pale. The antennæ proceed from bases which lie wholly beneath the former; and both are of the same olive-green colour as the tentacular base. The column of each agrees with that of the tentacle, but the enlargement below the tip is barely appreciable. The palpi are absent. The tentacular and dorsal cirri are all covered with short, thick clavate cilia, the dilated extremities of the latter showing a granular interior. The anterior cirri have a slight enlargement below the filiform tip, but throughout the greater part of the body they taper from the base upward. The base of the cirrus soon becomes connected with the pigment of the dorsum, and posteriorly the same dark grey coloration passes along the dorsal aspect of the column. The ventral cirri are short and subulate, and the tips do not reach the bases of the bristles. The ventral papilla is a well-developed cylindrical process.

There are fifteen pairs of scales which meet in the middle line of the dorsum anteriorly. The first has a greyish border all round with a whitish spot in the centre. The rest, as a rule, present a dark granular inner half, the outer being whitish, with a spot of the same blackish pigment. Structurally (Pl. XX. fig. 9) each is covered with short thick cilia,

which in some cases are mere tubercles, so that under a low power or a lens the blackish pigment has a minutely punctate appearance. In some the inner and posterior border is slightly crenated, the short cilia projecting from the summit of each little elevation.

The feet are comparatively short, and the pallor of the bristles is in contrast with the dark pigment of the dorsum. They agree closely in general outline with those of *Polynoë scolopendrina*. The dorsal division of the foot has a series of somewhat short slender bristles (Pl. XIA. fig. 8) tapered from base to apex, and having distally very distinct hispid rows. They are covered with parasitic growths. The tips do not show the smooth terminal region so common in the group.

The ventral consist of pale and rather straight bristles (Pl. XIA. fig. 9) with boldly bifid tips, and well-marked spinous rows. The distal region of the bristle is proportionally short, a feature sometimes seen in commensalistic Polynoidæ, in which respect this form closely agrees with *Polynoë scolopendrina*.

In transverse section of the body-wall, the muscular constituents are largely developed, and the nerve-cords large, though the area is narrow. The hypoderm is very thin, but the cuticle is somewhat thick ventrally. The blackish pigment deeply tints the hypoderm over the dorsal arch. No reproductive elements occur in the specimens.

This evidently takes the place of our *Polynoë scolopendrina*, to which it is closely allied, but from which it differs in the absence of the large superior ventral bristles, and in the much more conspicuously ciliated condition of the cirri and scales.

Polynoë (*Macellicephala*) *mirabilis*,[1] n. sp. (Pl. XVI. fig. 1; Pl. XIIA. figs. 9–11).

Habitat.—A single example was dredged at Station 169 (off the north-west corner of the North Island of New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; blue mud.

The length of the specimen is about 25 mm., and its breadth, inclusive of the bristles, 18 mm.

The body is thick and massive, little tapered anteriorly or posteriorly. The dorsal surface is pale, but the ventral in the preparation has a fine lustrous purplish or mauve hue, best marked on the slightly everted proboscis.

The head (Pl. XVI. fig. 1) presents great divergence from the ordinary type in the Polynoidæ. Anteriorly, it has two flattened lobes, which toward their inner border bear a short filiform process, that may be the homologue of the antenna. A wide hiatus separates the two lobes, and extends posteriorly almost to the base of the tentacle. The posterior part of the head is formed of two rounded eminences which bulge at each side,

[1] μάχελλα, a shovel.

so that the outline of the head is somewhat like a broad and flattened Scotch thistle. The base of the tentacle is attached between the two posterior lobes, and is thus placed far backward. The organ is smooth, very long (extending beyond the tips of the palpi), and much tapered. The palpi are also smooth, of considerable length, and taper from base to apex. They show the usual dorsal ridge in the preparation. The tentacular and dorsal cirri are long, smooth, tapering processes with a slight swelling below the filiform tip. The ventral cirrus is very small or filiform, and does not reach the base of the ventral bristles. The ventral papilla is unusually large though short, and occupies the ordinary position. Traces of two large cirri occur on each side of the anus (which is terminal), but the condition of the posterior end does not admit of accurate description. The dorsal surface of the proboscis shows two papillæ, one beneath each flattened frontal lobe.

The pedicles of nine pairs of scales exist in the preparation.

The feet are largely developed, their soft parts considerably exceeding the breadth of the middle of the body, and the process for each spine is long and slender. The dorsal division bears a comparatively small number of brittle, flattened, iridescent bristles, of large size and devoid of serrations (Pl. XIIA. fig. 9). The tip is very gradually diminished, and ends in a somewhat blunt point. On the whole they are thin and fragile, from the large size of the internal cavity.

The ventral bristles are even longer in proportion and extremely slender, the flattened diaphanous spear-shaped tips showing obscure traces of spines along each side, one, however, being more distinctly serrated than the other (Pl. XIIA. figs. 10, 11, one of the smaller forms).

The testes formed thick and rather firm curved sacculi beneath the glandular intestine.

At first sight the form might readily have been mistaken for a *Hesione*. The state of the bristles somewhat resembles those in epitocous Nereides, and the massive external appearance of the body is evidently due to the development of the sexual elements.

The cuticle forms a thin investment ventrally, and the hypoderm is likewise attenuate. The median area is arched over by the oblique muscles which meet in the middle line. The cords are somewhat flattened. The muscles of the body-wall follow the ordinary type, but they are comparatively small. The proboscis is large, is devoid of median folds either dorsally or ventrally, and the circular fibres near the outer margin are developed more distinctly than usual. The hypoderm on the inner surface is deeply tinted (dark brownish).

Polynoë (*Robertianella*) *synophthalma*, n. sp. (Pl. XIV. fig. 4; Pl. XX. fig. 5; Pl. XIIA. figs. 12, 13).

Habitat.—An injured specimen occurred at Station 3 (in the Atlantic south of the Canaries), February 18, 1873; lat. 25° 45′ N., long. 20° 14′ W.; depth, 1525 fathoms; bottom temperature 37°·0, surface temperature 65°·0; hard ground.

Another was dredged at Station 124 (off Macis, Brazil), September 11, 1873; lat. 10° 11′ S., long. 35° 22′ W.; depth, 1600 fathoms; mud.

This species is readily distinguished by the large and peculiarly shaped head, formed of two ovoid masses, and the very large size, position, and nearly confluent condition of the eyes. The total length is about 15 mm., and the breadth over the bristles 5 mm.

The body is narrow and elongated, and tapers much posteriorly, but very little anteriorly. It is pale throughout.

The head (Pl. XIV. fig. 4) is deeply cleft in front, and formed of two symmetrical ovoid lobes, which have the large and characteristic black eyes toward the posterior border. The somewhat ovoid eyes are placed in a transverse line, the outer on each side being the larger, as well as more elongated from before backward, and its inner border abuts on and mingles with the pigment of the more rotund eye. Only the base of the tentacle remains attached to the central hollow at the front of the cephalic lobes. The antennæ are short and slightly tapered. The palpi are of moderate length, quite smooth, and tapered from base to apex. The tentacular and dorsal cirri are smooth, simple, tapering processes, and the latter when fully developed stretch far beyond the bristles. The tip of the slender ventral cirrus reaches considerably farther than the bases of the bristles. The ventral papilla is proportionally large.

No scales are present in the Brazilian example, but the scars seem to be about thirteen in number on each side. The other specimen had two pale thin scales, perfectly smooth, and as transparent objects presenting only areolar hypodermic tissue and somewhat large branching nerves.

There are about thirty feet (Pl. XX. fig. 5), which are somewhat depressed below the level of the rounded body. The dorsal region of the foot bears a series of pale translucent bristles, the shorter forms next the body showing a few indications of spinous rows near the tip. The rest are longer, have only a slight curve, and the tips are comparatively blunt (Pl. XIIa. fig. 12, one of the longer forms), with a trace of a mucro, apparently an indication of the peculiar structure in the inferior bristles. They are finely striated longitudinally, and marked by a few transverse lines.

The ventral bristles are similarly translucent, have a slender shaft and a comparatively broad tip, which exhibits faint serrations along its edge, and a distinct though minute notch at the extremity (Pl. XIIa. fig. 13). They are considerably longer than the dorsal bristles, but are similarly striated longitudinally.

The proboscis has a large rounded boss or papilla projecting from its dorsal surface, immediately beneath the tentacle.

The specimens seem to be males.

The state of preservation renders transverse sections unsatisfactory, but so far as could be made out, the oblique muscles meet over the nerves, which project downward

as large round cords. The muscular and other arrangements seem to conform to the ordinary type.

A *Polynoë* with similar large and nearly connate eyes, which, however, are arranged longitudinally rather than transversely, is described by Panceri[1] under the name of *Pholoë brevicornis;* but the species clearly diverges from *Pholoë* in essential structure, indeed, is apparently allied to the *Hermadion pellucidum* of Ehlers. The absence of the dorsal tentacles may have been accidental. The species approaches *Alentia.*

Polynoë (*Admetella*) *longipedata,* n. sp. (Pl. XIV. fig. 5; Pl. XX. fig. 6; Pl. XIIA. fig. 17).

Habitat.—Two examples were dredged at Station 146 (to the east of Prince Edward Island), December 29, 1873; lat. 46° 46′ S., long. 45° 31′ E.; depth, 1375 fathoms; bottom temperature, 1°·5 C.; Globigerina ooze.

The larger specimen (a female) measures about 65 mm. in length and 20 mm. across the widest part of the body and the fleshy part of the feet, or 30 mm. inclusive of the bristles.

The body is somewhat fusiform in outline, being rather more tapered anteriorly than posteriorly. It is pale and soft, and the great length of both feet and bristles is characteristic. There are upwards of sixty segments in the one and fifty in the other.

The head (Pl. XIV. fig. 5) is comparatively small, totally devoid of eyes, and its limited area much encroached on by its processes. It is wide in front and narrow behind. A prominence on each side posteriorly resembles an ocular region, but there is no trace of pigment, nor any indication of its having been a pale eye. The tentacle is absent, but judging from the large area occupied by its base in the middle of the head, it seems to have been of considerable size. From the front of the base outward on each side is attached a thin flattened process, broad at its origin and tapering to a blunt tip. It thus lies above the antennæ, and apparently is homologous with the scale at the base of the tentacle in the Sigalionidæ. This is the only example in which such a process has occurred in the Polynoidæ, and its presence is therefore both suggestive and important. The antennæ are somewhat small and filiform, their delicate tips extending only a short distance beyond the ends of the former processes. The palpi are both large and long, and taper from base to apex. They are smooth, and their margins show only very fine crenations from contraction. The tentacular and dorsal cirri are very long (though shorter than the palpi), smooth, and somewhat translucent, with a slight enlargement below the attenuate tip. The ventral cirrus is filiform and comparatively short (not reaching the tip of the setigerous region). It springs from the middle of the free portion of the foot. In the

[1] La Luce e gli organi luminosi di alcuni annelidi. *Atti Accad. Sci. Napoli,* t. vii. p. 16, Tab. iii. figs. 13–15, and Tab. iv. figs. 6–8, Napoli, 1875.

male the ventral papillæ are much longer and more tapered than in the female, indeed the terminal region is separated from the basal by a joint. In both, the processes as well as the enlargement at the base are well developed.

All the scales are absent, but judging from the pedicles, twenty-four pairs seem to have been present. The pedicles are borne far outward on the feet, so that they appear to be parts of, and must be freely movable with, these organs.

The feet are greatly developed, both as regards the setigerous division and the bristles. The foot behind the tentacular cirri bears dorsally the first scale, and a ventral cirrus fully as long as the former cirri. The next foot has a much smaller ventral cirrus, which does not reach so far outward as the terminal process covering the end of the spine of the succeeding foot. The feet gradually increase in the free portion, and soon become very prominent organs. When fully formed there is dorsally either a pedicle for a scale or a cirrus (Pl. XX. fig. 6), which, though long, does not extend beyond the tips of the bristles. A long elevation terminating in the process covering the dorsal spine next succeeds; but in no instance are any traces of bristles visible.

The inferior branch has its spinous process greatly elongated, and from this point downward is a series of very long, flexible, and translucent bristles, which flatten out as they approach the tip, and become serrated after the manner of the Polynoidæ, but the extremity (Pl. XIIa. fig. 17) is quite different from anything yet known in the group. It curves from the serrated edge, and diminishes to form two broad, dagger-like, terminal processes. The spinous rows beneath the latter are very fine.

A large though somewhat flattened boss occurs on the proboscis, close beneath the central frontal region. The anus is almost terminal.

In the female the ova are both large and numerous.

The structure of the body-wall of this form shows certain interesting divergencies from the ordinary type. Thus the cuticle is thin, ventrally, while the hypoderm in the middle line is greatly developed, forming a thick layer over the nerve-area and the ventral longitudinal muscles. This coat is not scooped out opposite the nerves to any extent, the circular muscular fibres mostly passing to their exterior, though the preparation is not so well preserved as to show these fibres distinctly. The cords are thus placed far inward, and have a band of connective tissue separating them from the body-cavity. They are rounded in transverse section.

The ventral longitudinal muscles are peculiarly curved (apparently rolled together), so that in section they are kidney-shaped, the hilum being superior.

The wall of the proboscis is somewhat thin, the cuticle well-developed, and the hypoderm blackish. A conspicuous ridge occurs dorsally and ventrally.

In the presence in the dorsal division of a solitary spine and the absence of bristles, this species agrees with Mr. Haswell's *Polynoë astrolepis* from Torres Strait.[1]

[1] *Proc. Linn. Soc. N. S. Wales*, vii. p. 292.

Polynoë ocellata, n. sp. (Pl. XII. fig. 3; Pl. XIIA. figs. 18, 19).

Habitat.—Dredged in considerable numbers as a commensalistic form in the tubes of *Spiochætopterus challengeriæ* at Station 233A (off Kobé, Japan), May 19, 1875; lat. 34° 38′ N., long. 135° 14′ E.; depth, 50 fathoms; surface temperature, 62°·6; sand. The species thus follows the habit of *Polynoë scolopendrina*, Sav., in the tubes of *Terebella nebulosa* in the Outer Hebrides, of *Polynoë marphysæ*, M'I., in the tubes of *Marphysa sanguinea* in the Channel Islands, and other forms.

The species is extremely elongated and narrow, reaching 60 mm. and upward in length, while its breadth, inclusive of the bristles, is about 2·5 mm.

The body is slightly tapered in front, but more so posteriorly, the tail being terminated by two short styles. The general colour of the dorsum is dull yellowish, marked with olive. Each segment is more or less barred transversely with dark olive bands, those in the middle of the body being divided into two squares by a median line, while the narrow anterior and broad posterior bands are interrupted in each segment. Ventrally the anterior fifth is pale, thereafter a blackish pigment-spot occurs at the base of each foot.

The head is shielded by the first pair of scales, and its transverse diameter exceeds its antero-posterior. On each side of the tentacle the anterior border has an acute peak, and the depressed median region behind the tentacle gives the usual bilobed aspect to the head. A large rounded eye is situated on each side a little in front of the lateral prominence, and a smaller one at the posterior border. The former are much wider apart than the latter. Both show a pale central region over the pigment, and this sometimes becomes elevated as a phlyctæna in the specimens, which are imperfectly preserved, from their position inside the tubes. The tentacle is not so long as the palpi, and tapers from the base to the terminal enlargement, which has a filiform process of considerable length at the tip. The antennæ are shorter than the tentacle and more slender, and the terminal enlargement is less marked. The palpi are fairly developed, gradually tapered toward the tip, which is abruptly filiform. The tentacular cirri resemble the tentacle. The dorsal cirri, again, while they show a distinct enlargement below the tip anteriorly, soon lose this, and the organs assume a simple filiform character. After the twentieth foot the cirri do not extend beyond the tips of the bristles till near the posterior end, where they again become a little longer than the tips of the bristles. All the foregoing organs are quite smooth. The ventral cirrus is short and subulate, the tip extending a little beyond the bases of the bristles. The ventral papilla is well marked, and as the eminence at its base is indicated by a pigment-speck throughout the greater part of the body, the arrangement is unusually distinct.

The number of scales is upwards of fifty pairs. The first scale is nearly colourless

and translucent, and the next four or five have the pigment-patches much less developed than their successors. In the typical forms there is a large ovoid, blackish, or dark olive pigment-spot on the inner side of the surface of attachment; while the latter is characterised by a very distinct ring of the same pigment. Moreover, a series of very distinct whitish specks occur over the greater part of the surface, and they are especially evident over the dark pigment-patch previously alluded to. There are also a very few minute clavate papillæ externally. The margin of the scale is perfectly smooth, and its whole structure delicate and translucent. The pigment of the dorsum, indeed, shines through the scales, and thus gives a very complex appearance to the coloration of the body, the central region of which is left uncovered throughout the greater part of its extent. In vertical section both cuticle and hypoderm are unusually thin.

In some respects the structure of the foot approaches that of *Achloë astericola*, D. Ch., in others it diverges. Thus it resembles the European form in the comparative shortness of the foot, the proportions and shape of the cirri, and the reduction of the superior division; whilst it diverges from it essentially in the absence of branchial process, in the structure of the bristles, and in the absence of bristles from the superior division.

About the twentieth foot the superior lobe is represented by a conical papilla, into the base of which the tip of the superior spine enters. There is no trace of superior bristles. The inferior division of the foot differs in shape from that of *Achloë astericola*, being pointed superiorly and obliquely slanted off inferiorly. A large spine proceeds to the superior angle of the process, and two dense groups of bristles pass from its edge. The superior or smaller series consists of slender forms with elongated spinous tips, ending in a slightly hooked point, the spines coming close to the latter, so as at first sight to give a bifid appearance to the extremity. The inferior group shows a diminishing series of shorter tips from above downward. So far as can be made out, the tip has a short terminal hook with a spur beneath, and a series of proportionally long spinous rows (Pl. XIIA. fig. 18).

At the fiftieth foot the general structure remains the same, the dorsal cirrus, however, being now shorter than the bristles. Between the two groups of bristles in the inferior division, two powerful examples occur (Pl. XIIA. fig. 19), their shape and size somewhat resembling those that alone appear in *Achloë astericola*, though the differences are characteristic. These bristles have shafts four or five times thicker than the former (fig. 18).

The chief change at the hundredth foot consists in the occurrence of only a single large bristle between the superior and inferior ventral groups.

The proboscis presents the ordinary structure, and is of the average length. The maxillæ have very prominent cutting edges running outwards from their bases. In the intestine the greyish debris contained vast numbers of the hairs of minute Crustacea, Radiolarians, various Diatoms, and shreds of tissue.

In transverse section the body-wall is invested by a well-marked cuticle, thickest ventrally, especially in the middle line. The hypoderm, on the other hand, is very thin. The dorsal longitudinal muscles are peculiar, for they are continued as a thick mass to the middle line anteriorly, where they almost touch, being only separated by strong vertical bands of muscular fibres which pass downward. The ventral longitudinal muscles are not much thickened externally, and only moderately diminished internally. The ventral area is well marked, a considerable interval occurring between the oblique muscles. The cords are somewhat flattened, and have superiorly a thin stratum of longitudinal muscular fibres.

In the sections the proboscis has been cut posteriorly. The external longitudinal muscular layer is very powerful, and between it and the great internal glandular coat a thin stratum of circular fibres occurs.

A few minute ova appeared at the bases of the feet.

The *Polynoë vittata* of Grube,[1] from Sitka, is an allied form with forty-three pairs of scales. Commensalism, indeed, seems the rule in those most nearly related. The *Halosydna lordi* of Baird,[2] a pale species from Vancouver Island, lodges between the mantle and foot of *Fisurella cratitia*, Gould; while another very fragile form (*Halosydna fragilis*, Baird[3]), approaching *Achloë*, frequents a Starfish in the same region. Another allied form, the *Lepidametria commensalis*, Webster, lives in the tubes of *Amphitrite ornata*, Verrill,[4] on the Virginian coast, and it has scales extending throughout the entire length of the body. Like all the preceding, it also has dorsal bristles. Other forms, such as the *Polynoë rutilans*[5] of Grube, are shorter, with only fifteen pairs of scales. The species just mentioned was found on *Xenia*, an Alcyonarian from the Philippines. Dr. Baird[6] also mentions that a variety of *Harmothoë imbricata* lives in the tubes of *Chætopterus insignis*, Baird, at the Menai Straits, near Beaumaris, but an examination of the preparations in the British Museum shows that two species, quite differing from *Harmothoë imbricata*, had been confounded together. One is *Nychia cirrosa*, Pall., and the other resembles *Polynoë longisetis*, Grube (*Harmothoë malmgreni*, Ray Lankester).

Polynoëlla levisetosa, n. gen. and n. sp. (Pl. XI. fig. 4; Pl. XV. fig. 3; Pl. XVI. fig. 4; Pl. XVIII. fig. 6; Pl. XIX. fig. 8; Pl. XIA. fig. 7; Pl. XXXIIA. fig. 6).

Habitat.—A single specimen was trawled at Station 235 (south of Yedo in Japan), June 4, 1875; lat. 34° 7′ N., long. 138° 0′ E.; depth, 565 fathoms; bottom temperature 38°·0, surface temperature 73°·0; mud.

[1] *Archiv f. Naturgesch.*, xli. p. 82, *fide* De Quatrefages, &c.
[2] *Journ. Linn. Soc. Lond.*, viii. p. 190.
[3] *Ibid.*, p. 191.
[4] Annel. Chetop. of the Virginian coast (*Trans. Albany Inst.*, vol. ix., 1879), p. 10, pl. iii. figs. 23–31.
[5] Annel. Fauna d. Philippinen, p. 37.
[6] *Journ. Linn. Soc. Lond.*, viii. p. 161.

A short and somewhat elliptical as well as massive though pale and soft form, distinguished by its large smooth scales, short tentacle and palpi, the great size and paucity of the ventral bristles (not more than two being present in any case), and the absence of the dorsal bristles. It measures, including the protruded proboscis, about 18 mm. in length, and is 11 mm. transversely from tip to tip of the bristles.

The head (Pl. XV. fig. 3) is wider than long, and furnished with four large eyes, the smaller pair lying at the posterior border, and nearer each other than the anterior pair, which occupy the lateral prominence about the middle of the head. The latter are large oval eyes, having a whitish opacity in the centre, as also have the posterior pair. A well-marked median hollow separates the broad head into two halves. The base of the small subulate tentacle proceeds from the anterior margin of the head, and after an interval on each side is the antenna, the base of which is slightly longer than that of the former, while the process itself is somewhat shorter. The small palpi lie exterior to the latter and inferiorly, and the tips do not reach so far outward. They are short, smooth, nearly cylindrical, except at the blunt conical extremities, which have a few brownish pigment-grains just above the distal narrowing. They are the smallest palpi yet observed, and with other points indicate a change of type. The tentacular and dorsal cirri are simple, smooth, filiform processes. The latter in the middle of the body scarcely reach beyond the fleshy part of the foot, but as usual are a little longer in front and posteriorly. Their bases are greatly enlarged, forming tumid masses, from which the somewhat slender cirri proceed (Pl. XV. fig. 3). The ventral cirri are short and subulate, and do not reach the bases of the bristles by a long interval. The ventral papilla is moderately developed, and is normal in position.

The proboscis (Pl. XVI. fig. 4) shows the typical nine papillæ dorsally and ventrally, and the jaws are amber-coloured, slender, and sharp. Two elongated papillæ occur on each side, about the middle of the extruded region.

In transverse section the posterior region of the proboscis follows the dermal tissues in diverging from that of the ordinary forms of the Polynoidæ. Externally is a well-marked stratum of circular fibres, beneath which the chief layer occurs, viz., that apparently homologous with the hypodermic coat, and consisting of a thick glandular investment, the folds of which often have a pennate appearance in section precisely as in the anterior region of the Nemertean proboscis. The basal part of the coat is the more fibrous, the distal the more glandular.

If this layer correspond to the great muscular coat of the ordinary type, then the further differentiation of the fibrous basal region into the latter layer, and the condensation and differentiation of the distal into the firm stripe of hypoderm and the dense cuticle occurs. Perhaps, however, the dense layer is an addition. No other layer is present. The organ differs from the ordinary type in simplicity, and thus corresponds with the condition of the skin and the bristles. In any case, the

resemblances of the Nemertean proboscis to this organ make it more likely that the true homologies point in this direction rather than in the way of the ingenious theory (of the *hypophysis cerebri*) of my friend Prof. Hubrecht.

There are twelve pairs of scales, which are pale, rather thick, and friable, quite smooth, and beautifully though not regularly reticulated, the margin alone being granular (Pl. XIX. fig. 8, and Pl. XVII. fig. 6).

About twenty-three feet occur on each side, and the fleshy part of each is largely developed. Dorsally a wedge-shaped depression makes the base of each bifid. The dorsal division is wholly devoid of bristles, and forms a soft, conical, and minutely granular elevation.

The ventral branch of the foot is much developed, forming a long, slightly tapered process with a bifid tip. It bears one or two long, stiff, light amber-coloured bristles, the appearance of the body being characteristic in this respect. The tip in most is slightly bent from injury (Pl. XIA. fig. 7), then the bristle gradually widens downward to a kind of shoulder, after which the shaft is cylindrical. The whole to a certain extent resembles what the central axis of the ordinary ventral bristle is in the Polynoidæ, all the processes being absent. A single large spine occurs as a support to this region.

In the structure of the body-wall (Pl. XXXIIA. fig. 6) this form deviates from the ordinary type of the Polynoidæ. The cuticle throughout the greater part of the section is indistinct, the only part where it is clearly visible being the dorsal arch, just over the dorsal longitudinal muscles and median line. On the other hand, the hypoderm is greatly developed. As in the Nemerteans, the layer consists of large areolæ with fibro-granular meshes, when cut obliquely, or of a series of vertical spaces with intervening fibro-granular bands in vertical sections. Its thickness is also remarkable.

The muscles of the body-wall are formed somewhat after the type of those in the Polynoidæ, but they are less bulky, the contrast between this and such as *Lepidonotus squamatus* being very striking. Thus there are a pair of dorsal longitudinal muscles, thick externally, and thin internally; a pair of ventral longitudinal muscles, which are small and but slightly curved. The oblique muscles pass over the inner margin of the latter, and, meeting or nearly meeting in the middle line, form an arch over the nerve-cords. The latter are proportionally large and rounded, occupying the thickness of the hypoderm, with the exception of a superficial region. The large cords lie close together, separated only by a median raphe, and their tissue in section is more lax than usual. The muscles forming the arch of the foot and the dorsum are feebly developed.

Granular masses were present at the bases of the feet, and probably represent the male elements.

Mr. Haswell[1] mentions that *Lepidonotus melanogrammus*, from Broughton Islands,

[1] *Proc. Linn. Soc. N. S. Wales*, vol. vii. p. 284, pl. viii. fig. 13, &c.

near Port Stephens, Australia, and *Lepidonotus simplicipes*, from Griffith's Point, Western Port, have no dorsal bristles, while *Polynoë ochthœbolepis*, from the Queensland coast, has nothing else than a tubercle. There does not seem to be anything else in common. His *Polynoë asterolepis*, from Torres Strait, again, has only a spine in the dorsal division.

Eulepis, Grube.

Eulepis wyvillei, n. sp. (Pl. XIX. fig. 11; Pl. XX. figs. 2, 3; Pl. XXIV. figs. 2, 3; Pl. XXV. fig. 11; Pl. XIVA. figs. 4–6; Pl. XXXIIA. fig. 7).

Habitat.—A single example was dredged at Station 33 (off Bermuda), April 4, 1873; lat. 32° 21′ N., long. 64° 35′ W.; depth, 435 fathoms; surface temperature, 68°·0; sea-bottom composed of coral mud.

It is a stoutish form about 18 mm. in length and 3 mm. in breadth.

The body is elongated, slightly tetragonal, firm and tapered a little at either extremity. The dorsum is rendered irregular by the prominent processes for the scales, and the dorsal projections of the feet. The ventral surface, again, is flattened, and forms a plane somewhat below the level of the feet. The body terminates in a central anal papilla with the opening directed backward.

The head is rounded and eyeless, marked only by central lines running back from the tentacle, which is a short conical process, somewhat enlarged at the base and with a bulbous tip. The long processes for the first pair of scales cover the greater part of the head posteriorly, leaving only the central region exposed anteriorly. On each side and a little in front of the tentacle is a short and thick antenna, slightly tapered towards the tip. The relation of the three processes is therefore different from that in *Eulepis hamifera*, Grube.[1] The palpi are comparatively short and gently tapered, with a linear ridge superiorly. They are smooth with the exception of a few very minute and often bifid papillæ near the tapering extremity. The first pair of feet bear the tentacular cirri, the shorter inferior organs having a more distinctly bulbous tip than the more elongated superior. The ventral cirrus is somewhat elongated in front, but soon becomes short and bulbous, with a clavate terminal appendage. At the base of the foot, internal to the foregoing, is a tumid enlargement, which seems to be the homologue of that at the base of the ventral papilla in the Polynoidæ. It forms the border to the prominent ventral edge below the feet. The surface of each is dimpled, but the presence of an aperture is uncertain. A flattened branchial cirrus, again, occurs on the fifth segment, and a well-developed one on the seventh, and generally thereafter on each segment without a scale. It is terminated by a minute clavate tip, which would appear to indicate that morpho-

[1] Annel. Fauna d. Philippinen, Taf. iii. fig. 8, 1878.

logically it belongs to the cirrus-group. In its interior are many bands of fibres, apparently muscular.

The scales seem to amount to fifteen pairs, and are whitish and semitranslucent. They are borne on very prominent papillæ, which project in a divergent manner along the dorsum, and with the branchiæ give a remarkably rugose aspect to the region. They occur on the second, third, and fourth feet, on the sixth, eighth, and alternately to the twentieth, then on twenty-third, twenty-eighth, twenty-ninth, and some of the succeeding, the latter being small and much modified. The anterior scales are somewhat rounded, and marked by a deep notch externally (Pl. XXIV. fig. 3), or occasionally with a rudimentary papilla; while behind the foregoing region of the body a tongue-shaped process springs from the bottom of the notch, so as to give a peculiar character to the scale. The fourth scale is large, and elongated from before backward; and the fifth is irregularly quadrate. Posteriorly the organs are small, but they may be in process of development. The surface is quite smooth, with traces of hypodermic areolæ. In vertical section the cuticle of these organs is attenuate, and the intermediate hypoderm very thin.

The feet (Pl. XXIV. fig. 2) are thirty-four in number, and the majority are prominent and rather massive structures. The first pair, as already mentioned, are directed forward, each carrying the tentacular cirri superiorly on a special process, which has a papilla at the base of the fork, from which the bristles emerge. The special process at first sight appears to represent the ordinary dorsal cirrus, but a closer scrutiny reveals two spines (one to each cirrus) in the soft tissues, so that it really indicates the setigerous lobe of a foot. A tuft of simple slender bristles comes from each division.

The second foot (which from the ventral surface appears to be the first) has superiorly a single bristle with its shaft more slender than the others near it, and with an abruptly narrowed tapering tip which has a series of elongated spines on one side. Those beneath are simple bristles with a well-marked wing at the tip, which is bent at a very considerable angle to the shaft. The centre of the foot is occupied by a powerful dark brown spine, which in all is broken off as it emerges from the skin. A process which appears to be the ventral division has a few slender smooth bristles similar to those in the first foot. The ventral cirrus is greatly developed, the base being enlarged and the tip somewhat bulbous, the latter, moreover, being slightly differentiated.

The next foot (third) resembles the former, but shows two of the dark brown spines projecting through the skin. The superior group consists only of slender simple bristles, and stumps of larger ones. The middle and lower regions have many of the winged forms, while ventrally, between the latter and the cirrus, are groups of slender simple bristles as in the second foot. The ventral cirrus is now more slender, but presents the same differentiated clavate tip. This foot also bears a dorsal cirrus.

As we proceed backward the fissure between the dorsal and ventral divisions of the foot enlarges, partly from the increase of the former in an outward direction. At the

tenth foot the main dorsal group is formed of strong brownish bristles, which are all broken. The inferior division has superiorly a single serrated bristle (Pl. XIVA. fig. 4). The rest consist of the usual winged bristles.

About the middle of the body (*e.g.*, at the fifteenth foot) are superiorly a series of powerful golden bristles (Pl. XIVA. fig. 5), the tips being bent at right angles to the shaft, and tapered to an acute point. The posterior border of the shaft is often fimbriated, apparently from the splitting of the chitinous fibres, for the bristles are hard and brittle. In this division is also a group of slender simple bristles. A papilla bearing a tuft of slender serrated bristles occurs just behind the foregoing. The inferior branch again is furnished with the strong winged bristles (Pl. XIVA. fig. 6) as in front, and which diminish in size from above downward. In regard to the arrangement of these bristles in the foot it is found that the strong dorsal hamate bristles spring in a semicircle in front and to the inner side of the dorsal spine as well as round it; while the dense tuft of long slender bristles is directed from the papilla downward and backward between its own and the next foot. The ventral bristles pass off in a line behind the spine of the division. The bristles retain a similar structure to the posterior end—except that they become longer and more slender.

This annelid (which requires the institution of a new family) appears to differ from Grube's *Eulepis hamata* from Pandanon in the Philippines. The divergence has already been alluded to. The scales in *Eulepis hamata* are covered with papillæ, whereas in the present form they are perfectly smooth, and the structure of the cleft also diverges. The remarkable bristles which characterise the upper region of the inferior lobe of the foot are not mentioned by Grube, who, however, may have overlooked them. The comparison of such with those in the same region in certain Sigalionidæ (*Leanira*, &c.) may throw further light on the position of this form. This peculiar bristle has also certain affinities with the spinous bristle shown by Ehlers in his *Nephthys picta*.[1] The dorsal hamate bristles again are clearly modifications of the ventral, and in some of the posterior examples a slight wing is present on the acute tip.

Grube's species had two long anal cirri, covered with minute papillæ, whilst the other cirri were smooth. He placed it between *Panthalis* and *Sthenelais*.

In the structure of the body-wall (Pl. XXXIIA. fig. 7) this form, while agreeing in the general plan, differs somewhat from the ordinary examples of the Polynoidæ in the greater interval between the insertions of the oblique muscles, and in the flattening of the nerve-cords. Above the latter are transverse fibres, and in the middle line a narrow band of longitudinal muscular fibres. The hypoderm is slightly developed, and the cuticle is by no means thick. The dorsal longitudinal muscles are separated by a thin median arch, across which, however, a few longitudinal fibres extend. In its ordinary condition the proboscis differs from that in the Polynoidæ in having proportionally thicker walls,

[1] Die Borstenwürmer, ii., Taf. xxiii. fig. 35.

especially laterally, and in possessing a median lateral fold on each side, so that the cavity is quadripartite. A small ridge also occurs at the ventral pole. Exteriorly the organ has the usual hyaline chitinous investment, within which the dense fibres radiate outwards with a curve, the concavity of which is directed for the most part toward each pole. The circular fibres of the region are also more distinctly marked throughout than usual in the Polynoidæ. The hypoderm presents an interesting diversity in thickness; thus above the pole with the ridge it increases in bulk and again diminishes at the median fold, while toward the opposite pole it forms a much thicker layer. It is marked by numerous clear globules,—the homologues of the ordinary hypodermic globules,—which give a character to the organ. The internal cuticular lining is thick.

Eulepis challengeriæ, n. sp. (Pl. XX. fig. 1; Pl. XXIII. fig. 1; Pl. XXIV. fig. 1; Pl. XIVA. figs. 7, 8).

Habitat.—A fragment of the anterior end was dredged off Sombrero Island, West Indies, in from 390 to 450 fathoms.

This species is smaller than the preceding, the fragment having a diameter of a little more than 2 mm., and a length of 7 mm.

The head much resembles that of *Eulepis wyvillei*. There is a little blackish pigment on each side of the base of the tentacle, but no definite eye as in Grube's form. The tentacle has an enlarged base, but the distal portion is little diminished from its commencement, and has a blunt tip. On each side is a short, blunt antenna. The palpi resemble those of the previous species. The tentacular cirri have the same disposition, viz., an inferior thicker and a more slender superior and outer. There is a slight elevation in the situation of the ventral papilla, but it scarcely forms a process at the posterior margin of the foot-fold.

The scales have a similar texture, but no notch is present externally. The first pair, like the second and third, are small and irregularly rounded; each, moreover, being transversely and not antero-posteriorly elongated. This saves space, since the papillæ supporting them are on adjoining segments. They are quite smooth. Marginally they show a number of clear areolæ.

The structure of the foot (Pl. XXIV. fig. 1) agrees in the main with the foregoing, but the dorsal hamate bristles (Pl. XIVA. fig. 7) have the convex edge of the geniculated region distinctly serrated, whereas in the former species it is quite smooth. The single pectinate bristle (Pl. XIVA. fig. 8) at the superior edge of the inferior division also differs in having a shorter and stouter tip, the curvature of which, moreover, is more decided.

There is little in the structure of the body-wall to distinguish it from the foregoing. In regard to the proboscis, the radiate fibres are somewhat coarser, while the circular

are less distinct, and there is no median longitudinal furrow internally on each side. A ridge occurs at each pole, and the clear globules exist in the hypoderm, which has a tolerably even disposition all round. The organ is less rounded in section than the preceding.

Family Acoetidæ.

The family of the Acoetidæ was established by Kinberg[1] (his Family IV. Acoëtea) for the two genera *Eupompe* and *Panthalis*. Only a single example occurs in the present collection, but it adds something to our knowledge of the group, since in addition to the pedunculated eyes (ommatophores) it presents a pair of sessile eyes behind them. Kinberg's reference to these organs, viz., "Oculi pedunculati duo; sessiles nullas vidimus," will no longer apply. Three species were procured by Kinberg, but none by Schmarda. A single example is mentioned in the collection made by the German ship "Gazelle," and another in Grube's Philippine Annelids. The representatives of the family seem to be comparatively rare in all parts of the world. Only one form occurs in Britain, viz., the northern *Panthalis ærstedi*, Kinberg.

Eupompe, Kinberg.

Eupompe australiensis, n. sp. (Pl. XXI. figs. 4, 5; Pl. XXIII. fig. 8; Pl. XXIV. fig. 4; Pl. XXIIa. figs. 2–6).

Habitat.—A fragment of the anterior region was procured at Station 186 (apparently off Cape York, Australia, and probably in Endeavour Strait), September 8, 1874; lat. 10° 30′ S., long. 142° 18′ E.; depth, 8 fathoms; surface temperature, 77°·2; sea-bottom composed of coral sand.

A large form, the fragmentary anterior region measuring about 50 mm. in length, the diameter at its widest part being 24 mm. It is tinted on the highly convex dorsum a fine bluish-purple, probably arranged in transverse bars in life; and a pale band occurs in the preparation at each segment-junction. The entire segment is closely and distinctly marked with transverse furrows.

The head (Pl. XXI. fig. 4) is characterised by the two large ommatophores, the tips of which would seem to project outward beyond the margin of the scales in life. The greater part of these organs is deeply coloured with blackish pigment. Unfortunately the tips are considerably injured. They are iridescent, but show no special corneal differentiation. The ommatophores are together wider than the head. A little behind the base of each peduncle, and rather to the outer side, is a small sessile eye; and between these

[1] Freg. Eugen. Resa, p. 24.

is a somewhat lancet-shaped, short, flattened tentacle, attached to a basal process. It does not reach the middle of the peduncles of the ommatophores. The head forms a proportionally small and somewhat elongated area, divided into two lobes by a slightly elevated median raphe running from the base of the tentacle backward to the nuchal collar. Just in front of the base of each ommatophore is the antenna, which has a short and somewhat constricted basal segment and a slightly tapered column with a dilated terminal boss furnished with a filiform appendage. The dilated boss scarcely reaches the tip of the ommatophore. The column of the organ is pale brownish. The palpi are comparatively slender, regularly tapered towards the tip, which is slightly bulbous, and then suddenly filiform. The enlarged region is brownish. The first foot is turned forward, and bears the tentacular cirri, which are longer than the antennæ, but possess the same shape and filiform distal process. They have a brownish belt, partly on the dilated terminal portion and partly on the end of the column.

The acute forward prolongation of the snout gives the mouth (which is a longitudinal fissure) a characteristic appearance on the ventral surface (Pl. XXI. fig. 5). The anterior part of the fissure extends forward into the narrow region of the snout, while the posterior end is opposite the fourth setigerous segment. A beautifully regular series of furrows curves outward from the fissure, the majority of the lines having a more or less backward direction. The ventral furrow is deeply marked, an interrupted median ridge (much elevated in front) occurring in the groove, which commences opposite the tenth setigerous segment. The elevated region on each side of the groove is transversely furrowed, a conspicuous ridge, generally somewhat bifid at the inner end, occurring towards the posterior part of each segment.

The scales are imperfectly preserved, but a considerable number remain on the fragment. In regard to arrangement, the first and second scales of opposite sides slightly touch at the back of the head, though perhaps they and the third cover the region much more in life. The rest widely diverge. The first scale is irregularly quadrate in outline, the anterior margin having a series of clavate papillæ, which diminish in size from the outer to the inner margin. The processes on the anterior edge (Pl. XXV. fig. 4, representing a few of the outer) are irregularly lobed, and the majority are slightly branched. The hypodermic cells are well marked at the margins of the terminal lobes, and they are also very distinct over the area of the scale, which is variously folded and wrinkled. The second (right) scale has its outer margin provided with simple and rather broad clavate processes. The other scales have a smooth margin, and are large, rounded lamellæ, the surface of which is studded over with minute papillæ, and here and there with large, clear, hypodermic areolæ. When viewed in profile, the papillæ are low and flat, and appear almost like undulations on the surface. The brownish pigment has a dotted appearance under a lens, since it is absent from the clear papillæ.

The first bristle-bearing foot carries dorsally the papilla for the first scale. The

setigerous region beyond the papilla is short and deep, having superiorly a conical process, beneath a rounded tubercle and a few crenations, and then a tolerably straight margin directed downward and inward. At the superior conical papilla a group of stout, pale yellow bristles emerge. The tip in each is dilated inferiorly, marked by longitudinal striæ, and is slightly concave on the ventral edge, which has a series of minute spines on an area near the base of the striæ. The bristles beneath are much more slender, and have the shape of elongated and delicate spears, the point of each being minutely hispid almost to the base of the dilated part. The bristles become more and more slender toward the ventral edge of the foot, and the spines on the tip are chiefly congregated along one edge, after the usual type of such bristles. The ventral cirrus is large and thick, and extends beyond the setigerous lobe of the foot. Its tip is tapered to a blunt point, with just a trace of an enlargement below.

The second foot is similar, but it bears dorsally a comparatively stout cirrus. Superiorly a tuft of slender bristles with the attenuate spear-tips exists. The third foot carries the second scale, the fourth the third scale, the fifth a dorsal cirrus, the sixth bears the fourth scale, and so on alternately. At the tenth foot (bearing the sixth scale) a considerable alteration has occurred, a gradual change, indeed, taking place from the first backward. Below the scale the sides of the foot dorsally are covered with peculiar, elongated, and translucent papillæ. The tip of the foot has in front a large vertical flap, which extends downward to about the middle of the foot; this overlaps the tuft of long slender bristles superiorly, while the posterior margin of the extremity of the setigerous region is bordered by a similar though more adherent flap with which the stout bristles run parallel. In front of the latter, and extending beneath them, is a dense tuft of long slender bristles with hastate tips.

The chief changes which ensue at the posterior end of the fragment are the increase in the number and size of the long translucent papillæ on the dorsum of the foot, and the appearance of three large flat bullæ of a similar nature on the ventral border. The ventral papilla at the posterior margin of the base of each foot forms a kind of pocket; and the furrows at the bases of the feet dorsally cause the lateral regions to have a somewhat symmetrically folded aspect. Other noteworthy changes are the great increase in the strength of the median vertical row of bristles, and the alteration in the type of the dense ventral tuft, each bristle in which presents a prominent series of spines on the dilated part of the tip, and finally merges into a long feathery terminal process.

The foot (Pl. XXIII. fig. 8) at the posterior end of the fragment has superiorly a tuft of slender capillary bristles minutely serrated; besides a dense group of silky hairs, which form a felt-like mass after the manner of those in *Aphrodita aculeata*. They seem to end in simple filiform tips of extreme tenuity. A few of the somewhat slender forms with hastate tips then occur (Pl. XIIIA. fig. 2), the elongate extremities being distinctly spinous, very much more so than in the anterior feet. The first and last

extend downward below the superior series of the next kind, which are stout brownish spines characteristically curved at the ends, which latter are also slightly dilated. Some of these, from the inferior edge of the series, show toward the tip a minute filiform process after the manner of Kinberg's *Eupompe grubei* (Pl. XIIIA. fig. 3). The stronger bristles again, are more deeply tinged with brownish, and have an extremity which is blunt, apparently from wear (Pl. XIIIA. fig. 4), and the curved transverse lines at the base of the tip are more distinctly marked. These bristles are very brittle, and the majority are removed in handling the specimen. The curve at the tip probably indicates a connection with the type of the smaller kind (fig. 3) with the filiform process, which in most cases has been abraded. They diminish in size from above downward. The bristles which form the ventral tuft are of two kinds, the larger (Pl. XIIIA. fig. 5) presenting a more conspicuous terminal dilatation, while the smaller (Pl. XIIIA. fig. 6) and more numerous have long slender translucent shafts, with prominent spinous rows on the enlargement superiorly, the extremity being in the form of a long tapering process closely and regularly beset with fine spikes, so that it resembles a slender feather with its barbs. These bristles also decrease in size from above downward. The dorsal cirrus arises from the upper and posterior edge of the foot, and is often inconspicuous amongst the large papillæ, from which, however, it is distinguished by its basal joint, conical terminal region, and greater length. It forms a comparatively short, tapering process with a broad basal segment. The ventral cirrus is now comparatively short, and its tip does not reach the extremity of the setigerous region.

In the structure of the body-wall this form for the most part agrees with *Panthalis ærstedi*, Kinberg. The much greater size, however, emphasises various features. Thus the nerve-area is separated by a definite and firm basement-layer which comes from under the great longitudinal ventral muscles on each side, bends upward round their inner edges, and forms a transverse platform above the region. From the upper and outer angle on each side a process of this basement-tissue runs upward amongst the fibres of the oblique muscle, indeed, many appear to be inserted into it. Moreover, the whole upper surface of this basement-layer is occupied by the insertion of two great vertical muscles, which in this region (the anterior third) pass down from the proboscis. Such fibres do not occur in front, and are probably local. The nerve-area varies in appearance according as it is severed in the line of the ganglion or between them. In the former case it presents a large elliptical space with a protective layer of hypoderm externally (thick in the median line and tapered at each side), with traces of at least two small neural canals toward the middle line of the ganglia inferiorly. A series of convexities on the ventral surface seem to indicate the ganglionic regions. The interganglionic portion, on the other hand, is in each case slightly concave (upward) and the cords are flattened, so that the area is much diminished. The ventral longitudinal muscles are very large, and show a fissure running obliquely outward and

downward superiorly. This probably indicates the special fold in certain of the Sigalionidæ. The space between these muscles is considerably less than in the Polynoidæ. The dorsal longitudinal muscles are simple and almost connate superiorly. The proboscis seems to approach that of the Polynoidæ in general structure.

The genus *Eupompe* was established by Kinberg in 1855[1] for the reception of an example of the Acoetidæ from the vicinity of Guayaquil, Ecuador, South America. From this species that dredged by the Challenger is separated by the form of the cephalic processes and cirri, the presence of the pair of sessile eyes behind the ommatophores, and the structure of the bristles. None of the brush-shaped bristles,[2] moreover, seem to occur in this species.

Family Sigalionidæ.

The examples of this family are twelve in number, three ranging themselves under *Thalenessa*, one under *Sigalion*, two under *Psammolyce*, five under *Leanira*, and one under *Eupholoë*.

The genus *Thalenessa* was established by Dr. Baird in 1865 for *Sigalion edwardsi*, Kinberg, but as it appears to be unnecessary to constitute a genus for a form that readily falls under *Sigalion*, it has been selected for the present group, all of which are new.

All the species included in the genus *Psammolyce* are likewise novel, and four of the five species falling under *Leanira* are new. A distinct genus also requires to be constituted for the novel type *Eupholoë philippensis*, a form apparently intermediate between *Psammolyce* and *Pholoë*.

The collection made by the Challenger compares favourably with those made by other expeditions. Thus, for example, nine are given by Kinberg, one by Schmarda, four by Grube in his Philippine Annelids, and five in his list of Annelids from the "Gazelle."

The species range from shallow water (5 fathoms and under) to 1000 fathoms, the same genus (*Leanira*) in the present instance occurring at each extremity.

Thalenessa, Baird, *char. emend.*

Head with four large eyes, a very short tentacle, and a pair of antennæ. Scales leaving the dorsum uncovered anteriorly, and furnished with ramose papillæ on the margin. The feet present lamellar processes at the tip, and the ventral bristles are much stronger than in either *Sthenelais* or *Sigalion*. The ventral cirrus is also longer. It approaches *Leanira* in the structure of the head.

[1] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1855, p. 386.

[2] Freg. Eugen. Resa, Taf. vii. fig. 35, Ga.

Thalenessa digitata, n. sp. (Pl. XXII. fig. 2; Pl. XXIII. figs. 5, 6, 7; Pl. XXV. figs. 4, 5; Pl. XIIIA. figs. 7–10).

Habitat.—Dredged off the Admiralty Islands, March 1875; depth, 16 to 25 fathoms.

The specimen is in three fragments, the whole being about 125 mm. in length and about 5 mm. in breadth at the anterior third.

The greater part of the body anteriorly is tinted dorsally of a brownish hue so as to relieve the pale scales. The colour fades anteriorly and posteriorly.

The head (Pl. XXII. fig. 2) is remarkably indistinct, being overlapped by the nuchal fold posteriorly; and even when the latter is reflected the cephalic region is small. A pair of eyes of considerable size, and close together, occurs on each side. A short median tentacle lies in the centre anteriorly, with a short antenna close to the base on each side. Each of these organs is shaped somewhat like an awl-handle with the smaller end free. Above the palpus is a double process, the base consisting of a stout pedicle with a lamellar frill along the inner border superiorly, and splitting midway into a smaller filiform superior tentacular cirrus, and a larger inferior one, which, however, hardly reaches the tip of the first pair of feet. The palpi are long and gently tapered from base to apex.

Anteriorly the scales (Pl. XXIII. fig. 7) are somewhat rounded, posteriorly irregularly reniform. Their surface is perfectly smooth. The external margin has a series of peculiar digitate papillæ (Pl. XXV. fig. 5), the main stem being nearly cylindrical, then the process becomes bifid, and throughout the greater part of its length trifid, and some are provided with four digitations. Posteriorly one or two papillæ are visible, and the processes on the margin are few, one or two only being trifid. The nerves passing to the papillose margin and other parts of the organ are well developed in both anterior and posterior scales. The latter present a more distinctly granular region in the neighbourhood of the digitate processes. In vertical (transverse) section both cuticle and hypoderm are fairly developed. The complexity of the muscles connected with the scale and papilla is great, the most varied motions of this organ being produced with ease. Thus, for instance, depression of the scale is effectively done by the vertical or slightly oblique muscles, while elevation is accomplished by the relaxation of these and the contraction of the transverse.

The first pair of feet pass straight forward, and the second are directed only a little outward, so that the anterior margin (the palpi being curved backward inferiorly) appears to be formed of feet. The first foot (Pl. XXV. fig. 4) bears a scale, and at the tip has a large translucent lamella projecting from the anterior (or, according to position, the inner) margin. The same process occurs at the extremity of the second foot, and in

a diminished state in the subsequent feet, assuming from before backward a more ventral position. The arrangement of this curious fold is well seen on viewing the tip of the foot directly. It forms a rim extending continuously from the dorsal to the ventral margin posteriorly, and then, with a break, passes along the front of the foot to its summit, where a sinus again occurs.

Superiorly the first foot has a comparatively short group of stoutish serrated bristles. This division is widely separated from the inferior series, which has superiorly a few bristles with numerous joints, and a well-marked claw, with a secondary process at the tip. Below is the central series of strong bristles (Pl. XIIIA. fig. 9) with short tips, likewise furnished with a secondary process. The inferior series, again, approach the superior in having numerous joints in the tip, but they are much more slender. Both divisions of the foot show numerous long papillæ. The ventral cirrus forms a long, smooth tapering process which arises near the palpus and has a slightly bulbous tip.

Proceeding backward, it is found that considerable alteration takes place in the structure of the foot. The bristles of the dorsal division (Pl. XIIIA. figs. 7, 8) more closely approach the ventral. The superior and inferior bristles of the ventral series (with many-jointed ends) are generally absent, only the stout central bristles remaining, and their tips are reduced to a single segment (Pl. XIIIA. fig. 10), which has a few minute serrations along the inner edge, but they are neither so well marked nor so numerous as posteriorly. The latter (tip) gradually becomes longer toward the posterior extremity of the body, and shows many minute serrations along its edge, but it never assumes the many-jointed condition seen in the first foot. The rows of spikes at the distal end of the shaft also become very conspicuous toward the tip of the tail. Each foot (Pl. XXIII. fig. 6) bears on the prominences above its base a branchial cirrus with long cilia, and one or two ciliated cups along the superior border. Moreover, on the side of the body there are, in addition, a few minute top-shaped ciliated processes. The ventral cirrus is filiform and slender, and, behind the anterior sixth, reaches the base of the ventral bristles.

The specimen is a female, and is distended with ova posteriorly.

In the structure of the body-wall this form approaches *Eulepis*, and diverges from both *Sthenelais* and *Sigalion*. The ventral longitudinal muscles are less bulky and rounded than in the two genera mentioned, and, moreover, the outer border folds upward and forms a distinct spiral arrangement, and there is a special disposition of the dorsal longitudinal muscles, the inner or lower lobe of which is pinnate in transverse section, so that three lobes appear. The nerve-area is like that of the Polynoidæ and *Eulepis*, in having a free space between the oblique muscles. The cords are much flattened, and the hypodermic area between them and the dense cuticle is very narrow. A transverse band of connective tissue and fibres passes over the cords, and a granular pigment-patch occurs at the inner border of each ventral longitudinal muscle, from which it thins off

internally. The proboscis is more compressed (laterally) than in the previous forms, and circular fibres are not apparent. Externally is a firm layer of chitinous hyaline tissue. The inner border of the radiate fibres is generally more translucent than the rest, apparently from the action of the light on their curvature. The hypoderm is comparatively thin and fibro-granular, and between it and the radiate coat is a basement-layer. The cuticle is well marked. A ridge occurs internally at each pole, the fibres of the radiate coat opposite the larger or inferior ridge being coarsely arranged. Two nerve-trunks appear on each side, about a third removed from the poles. They lie, as usual, at the inner border of the hypoderm, *i.e.*, next the radiate coat or its basement-tissue.

Thalenessa oculata, n. sp. (Pl. XXI. figs. 1, 2 ; Pl. XXIII. fig. 12 ; Pl. XXV. fig. 3 ; Pl. XIIIA. figs. 11, 12).

Habitat.—One example was dredged at Station 162 (off East Moncœur Island, Bass Strait), April 2, 1874 ; lat. 39° 10′ S., long. 146° 37′ E.; depth, 38 fathoms ; surface temperature, 63°·2 ; sea-bottom, sand and shells.

A second (imperfect) specimen occurred in the dredge at Station 172 (off Nukalofa, Tongatabu), July 22, 1874 ; lat. 20° 58′ S., long. 175° 9′ E.; depth, 18 fathoms ; surface temperature, 75°·0 ; sea-bottom, coral mud.

The species is of considerable size, the former fragmentary example measuring about 55 mm. in length, and with the bristles 6·5 mm. in diameter.

The head (Pl. XXI. fig. 2) is distinguished by the very large size of the eyes, which are close together on each side, though the pairs are widely separated transversely. The anterior pair are the larger, and show a considerable pale area or "lens." In the smaller example from Tongatabu (Pl. XXI. fig. 1) the large anterior eyes present a peculiar appearance from the obliquity of the pigmentary semicircle (which is pointed in front) and the great size of the external pale region. The anterior margin of the head has a pair of short antennæ with somewhat blunt points, and behind them a median tentacle of nearly the same length, and having a similar blunt tip. Each of these processes are narrowed at the articulation near the base. This type of tentaculiferous head therefore differs from that seen in *Sthenelais boa*, with its great median tentacle and small antennæ. The proboscis in the larger example is extruded, and forms a smooth rounded bulla anteriorly.

The scales, which are comparatively thin, do not cover the dorsum anteriorly, and are considerably smaller than those usually seen in this region in the group. As indicated in the figure (Pl. XXI. fig. 1) of the example from Tongatabu, the scales are prettily dappled with brown. The first scale is small, rounded, simply granular in

structure, and its surface and margins are smooth. The second scale is about the same size, but has along its outer border five or six digitate processes, some of the stems being undivided, others bifid or trifid. The scales greatly increase in size after the third, and their outer margins are furnished with well-marked processes. In shape they are irregularly quadrate with a straight outer (or inferior) margin, along which the characteristic papillæ are ranged (Pl. XXV. fig. 3). The papillæ are in a single row, and commence at the anterior angle in the form of a process or two with the tip split into three long divisions or digits; then the latter in the succeeding reach four or five, and toward the posterior border again diminish to three, and finally end in a simple filiform process. In minute structure (Pl. XXIII. fig. 12) the exterior of the entire process is covered with transparent cuticle, which is dense on the main stem and thinner on the divisions, especially towards the tip. It rests on a granular portion of the scale, and the same hypodermic structure is continued into the centre of the process, an enlarged region occurring at the base of the divisions. In the latter the granules are finer and more translucent, indeed, they gradually become indistinct toward the tip. The posterior scales are reniform, and the digitate processes occasionally show a maximum of six or seven divisions. The nerves from the scar of attachment (umbilicus) are distributed to the papillæ in a very suggestive manner. It would appear that in some cases at least the scales in Sigalionidæ are even more diagnostic than the bristles.

When fully formed (in the anterior third of the body) the foot has superiorly a branchial process, two ciliated cups on the dorsum, and a process in the inner angle under the branchia. The dorsal division bears the usual serrated (whorled) bristles, which are more evidently pinnate in some than in others. There appears to be a difficulty in regard to the specific differences to be found in such bristles, and at the present moment no stable distinctive character can be adduced. Thus the thick part of one of the dorsal bristles of this species (Pl. XIIIA. fig. 11) diverges very little from that formerly shown in *Thalenessa digitata*.

The ventral division of the foot bears a group of the usual bifid bristles, the upper and lower series having longer tips than the central, some of the lower indeed in the anterior third of the body showing two segments in the terminal portion. The middle series, like the foregoing, present a few spinous rows below the tip of the shaft (Pl. XIIIA. fig. 12), and the terminal bifid piece is moderately elongated.

The ventral cirrus is somewhat long, and its slightly bulbous tip extends considerably beyond the setigerous lobe. There are several small papillæ in front of and behind the pedicles for the scales, and one on the ventral margin of the foot to the inner side of the cirrus. The ventral papilla occurs in the fissure behind each foot, and its basal enlargement presents a fold or pit externally.

The structure of the body-wall in this form corresponds in the main with that in the previous species. The transverse band over the nerves is perhaps more distinct as

it passes between the tips of the oblique muscles. The pigmented granular hypodermic (?) area at the inner border of each ventral longitudinal muscle is also distinct. The ventral cuticle is very thick. The radiate fibres of the proboscis are coarser in texture and show the differentiation at each end formerly alluded to. The peritoneal corpuscles abound at the basis of the branchial processes, and on section are seen to pass out of the tip. In both this and the former the dorsal longitudinal muscles meet as a thin stratum over the dorsal arch.

Thalenessa fimbriata, n. sp. (Pl. XIX. fig. 10; Pl. XXIII. fig. 4; Pl. XXIV. fig. 5; Pl. XXV. figs. 1, 2; Pl. XIIIA. fig. 13).

Habitat.—A single fragmentary specimen was dredged at Station 163B (off Port Jackson), June 3, 1874; lat. 33° 51′ S., long. 151° 22′ E.; bottom temperature 63°·0, surface temperature 69°·0; depth, 30 to 35 fathoms; sea-bottom, hard ground.

A somewhat small form in fragments, measuring, in all, more than 30 mm., and with a transverse diameter of 4 mm., including the bristles.

The head is covered by the first pair of scales and partly by the nuchal fold posteriorly. The eyes are formed on the same type as the preceding, and the pairs on each side are almost synophthalmic, and, moreover, the line of separation is nearly straight. The pigment of the anterior pair is somewhat triangular in outline, with the apex directed forward, and it is less dense than in the boldly marked posterior eyes. A short median tentacle alone remains, the small antennæ probably having been removed in the dredge. The palpi are as long and finely tapered as in the foregoing species, and quite smooth. Their cuticle is very dense, and presents a closely arranged series of fine transverse lines.

The first pair of scales are nearly circular, and perfectly smooth on surface and margin. The scales do not cover the dorsum anteriorly. They are marked by a nut-brown pigment along their anterior and posterior margins. Their external (or inferior) border has (Pl. XXV. fig. 1) numerous fimbriate papillæ, which, behind the anterior third of the body, have often more than a dozen filiform divisions. A short and thick main stem (Pl. XXV. fig. 2) springs from the border of the scale and soon breaks up dichotomously or irregularly into the filamentous processes, which have a different character from those of the preceding form. The scales are rounder in front, more or less reniform posteriorly.

The dorsal branch of the foot (Pl. XXIV. fig. 5) carries a series of somewhat short bristles, boldly spinous. In the anterior region of the body both this and the ventral division have numerous digitate papillæ of considerable size. The inferior bristles in the same region present superiorly a few with double-jointed extremities, the rest

(intermediate in position) have somewhat elongate tips of a single segment. Both shaft and tip are very translucent, the former showing, towards its distal end, a few indications of the ordinary spinous rows. The extremities have a peculiar curve (Pl. XIIIA. fig. 13) at the base of the terminal hook, the anterior edge especially being thin and translucent.

The ventral cirrus is long and tapering, the tip reaching considerably beyond the setigerous lobe. The enlargement usually connected with the ventral papilla is present, but no papilla is visible. Two ciliated pads occur on the upper border of the foot, and a process beneath the branchia. The foot is further characterised by the foliaceous cutaneous expansions on each side inferiorly. The specimen is a female, and has numerous large greyish ova posteriorly.

This form presents certain special characteristics in the structure of its body-wall. Thus, the longitudinal dorsal muscles meet in the middle line without much diminution, while their outer border bends inward and is once or twice spirally rolled. The ventral longitudinal muscles are compact and somewhat rounded in transverse section, the outer margin being pinnate and spirally rolled inward. Instead of the meagre margin of hypoderm seen in the former species, the ventral area is crown-shaped, broader, and with rounded margins superiorly—where the oblique muscles are attached, slightly contracted inferiorly—where the thin layer of hypoderm trends under the ventral longitudinal muscles. The area is thus large and deep, and the somewhat ovoid nerve-cord (in section) occupies the outer and inferior region, a distinct neural canal, moreover, occurring on the inner side of the nerve, about its middle. The rounded form of the ventral longitudinal muscles is evidently due to the strength and shortness of the oblique muscles which arch tightly over them superiorly. The cuticle is thick inferiorly, but the hypoderm forms a comparatively thin coat.

This form, therefore, approaches *Psammolyce* in the arrangement of its nerve-area.

Sigalion, Milne-Edwards.

Sigalion buskii, M'I. (Pl. XXII. fig. 1).

Sigalion buskii, M'I., Trans. Zool. Soc. Lond., vol. ix. pt. 7, p. 391, pl. lxx. fig. 14.
Sthenelais dendrolepis (Clap.), M'I., Trans. Roy. Soc. Edin., vol. xxv. p. 409, pl. xii. fig. 12, and pl. xv. figs. 4, 5.

Habitat.—Dredged, along with many other Annelids, at Station 75 (off Fayal, Azores), July 2, 1873; lat. 38° 38′ N., long. 28° 28′ W.; depth, 450 fathoms; surface temperature, 70°·0; sea-bottom, volcanic mud. The distribution of this species, which is very well characterised, is therefore wide, ranging from North Unst, Shetland, in 90 fathoms, to the Azores.

The specimen, which is incomplete posteriorly, is much larger than the Zetlandic form. The diameter of the latter, including the bristles, is 5 mm., while this is fully 7 mm. The great length of the bristles is conspicuous.

In addition to the characters already noted, it may be mentioned that this example has two very distinct though not large eyes situated on the wide part of the head, a little behind the anterior margin. Moreover, a series of simple filamentous papillæ occurs at the base of the pinnate processes on the margin of the scales, and on the outer side they extend somewhat beyond them.

The *Sigalion edwardsii* of Kinberg,[1] procured in the Atlantic on a stony and sandy bottom off the mouth of the River Plate, South America, is evidently a closely allied form, but the great divergence in regard to the structure of the scales prevents the identity of the two forms being established. Thus Kinberg shows a series of minute blunt spines or tubercles over the surface of the scale, and its outer margin has six or eight short, broad, pinnate processes, each of which has at most seven short blunt pinnæ; whereas *Sigalion buskii* has a perfectly smooth scale, and often fifteen long pinnate processes on the margin of the scale. Each of the pinnæ is lanceolate and granular, with a pointed tip, and instead of being only seven or eight, they are often more than double the number. Further investigation, therefore, of the scales and bristles of Kinberg's form is necessary for the removal of doubt, a remark which is even more applicable to the *Sigalion arenicola* of Verrill.[2]

The body-wall has a thick cuticular coat, but the hypoderm is thin, even in the nerve-area. The cords are flattened. The outer edge of the ventral longitudinal muscle forms in section a short lobe. The proboscis has the typical structure, with a ridge internally at each pole. The elastic arrangement externally at the latter is well developed.

Psammolyce, Kinberg.

Psammolyce occidentalis, n. sp. (Pl. XXII. figs. 5; Pl. XXIII. figs. 2, 3; Pl. XXVII. fig. 6; Pl. XIIIA. figs. 14, 15).

Habitat.—Two fragmentary examples were dredged off Sombrero Island, West Indies, in from 450 to 390 fathoms; sea-bottom, Pteropod ooze.

In the larger specimen, which, including the bristles, measures 5·5 mm. in diameter, the whole dorsum anteriorly is coated with whitish and pinkish Foraminifera, so that the anterior is very rough. The ventral surface of the body anteriorly appears downy, and the region behind minutely nodular, a feature due to the deposition of extremely fine calcareous ooze on the papillæ, which agree in appearance with those on the scales.

[1] Freg. Eugen. Resa, p. 30, Tab. ix. fig. 41, &c.

[2] *Proc. U.S. Nat. Mus.*, vol. ii. p. 167 (*fide* Verrill), and *Trans. Connect. Acad.*, pl. vi. fig. 5. I have not been able to consult the original description in the first mentioned.

The head (Pl. XXIII. fig. 3) forms a small rounded eminence at the base of the tentacle, and is somewhat concealed by the nuchal fold. No trace of eyes is visible in either specimen. The tentacle is a simple filiform process, which arises from an enlarged base and tapers gently to the extremity. The first pair of feet had lost the dorsal (tentacular) cirri, and the ventral only reached the base of the bristles. The latter are much more boldly spinous than the succeeding dorsal series. The palpi are long and finely tapered.

The first pair of scales project far forward like a prow, and instead of being smaller than their successors, as in the ordinary Sagalionidæ, they are conspicuously larger. All the scales (Pl. XXVII. fig. 6) are coated externally by Foraminifera, and fimbriated round the border. The cilia are long and slightly tapered toward the tip.

The feet are covered with numerous short papillæ, and the ventral cirrus is of moderate length, reaching almost to the tip of the setigerous lobe. Numerous long papillæ occur between the feet. The dorsal division bears a series of very fine bristles, with faintly marked spikes at the tip. Nothing so definite as Kinberg's[1] figure of the spikes in *Psammolyce petersi* could be observed, but perhaps these delicate processes may have been affected by their calcareous surroundings.

The ventral branch has stoutish flattened bristles (Pl. XIIIa. fig. 14, from the middle of the series) with brownish shafts and a single bifid joint at the tip. The latter becomes much more elongated superiorly and inferiorly (Pl. XIIIa. fig. 15). The distal end of the shaft is smooth.

This appears to differ both from the *Psammolyce arenosa*,[2] Delle Chiaje, which is probably the *Psammolyce herminiæ* of Aud. and Ed.,[3] and *Psammolyce albicans*[4] of De Quatrefages, by the shape of the first pair of scales and the structure of the ventral bristles. At least no mention is made of their peculiarities. M. de Quatrefages now places the *Leanira quatrefagesi* of Kinberg under the same genus, to which it certainly does not belong.

From the *Psammolyce rigida* of Grube, from the Red Sea, it is distinguished by the eyes which are at the corner of a quadrangle. It seems to be closely allied to his *Psammolyce umbonifera* from the Atlantic,[5] but as he does not describe the bristles minutely it is difficult to determine.

Psammolyce differs from *Thalenessa* and *Sigalion* in the structure of the body-wall, since the surface of the somewhat thin cuticle is studded with papillæ which are often coated with and joined together by extraneous deposits. The hypoderm is thin. The dorsal longitudinal muscles show no appreciable fold externally, and meet in the middle line dorsally. The ventral longitudinal muscles are reniform in transverse section (being rounded inferiorly, dimpled superiorly). The fasciculi both of these and of the

[1] Freg. Eugen. Resa, Taf. ix. fig. 43, Gs.
[2] Descriz. e not., t. v. pp. 58 and 107, Tav. 98, figs. 4, 5, &c.
[3] Annélides, p. 107, pl. iA. figs. 1–6.
[4] Annelés, p. 282.
[5] "Gazelle," &c., p. 521.

dorsal muscles appear to be coarser than in the genera above mentioned, and they have a somewhat regular arrangement, since the lines for the most part converge in transverse section to the hilum. The external process is probably homologous with the folded or spiral part in other forms. The ventral muscles are tightly bound down by the broad, oblique, muscular fibres, which pass from the body-wall to the ventral area, as in *Thalenessa fimbriata*. The muscles, moreover, encroach superiorly and laterally on the nerve-area, while a strong series of vertical fibres from the alimentary canal anteriorly pass to the median region. The latter probably cause the area to be drawn upward, making a deep median ventral groove. The nerve-cords, which appear to be somewhat rounded or ovoid, occupy each side of the median fibres. Bands of connective tissue form a layer above them, and to this the muscular fibres seem to be attached, though, as formerly mentioned, some median fibres pass through. So far as observed, the structure of the proboscis posteriorly agrees with the typical form.

Psammolyce fijiensis, n. sp. (Pl. XXI. fig. 6; Pl. XXII. fig. 4; Pl. XXIV fig. 6; Pl. XIIIA. fig. 18).

Habitat.—A fragment of the anterior region was dredged off Levuka, Fiji.

The diameter of the fragment is 4·5 mm., inclusive of the bristles.

The entire dorsum is covered by somewhat coarse grains of sand, the scales likewise having the same coating. An ochreous tinge occurs here and there, and indeed is prevalent along the sides and on parts of the scales. The ventral surface again has this ochreous hue throughout most of its extent, relieved only by the long pale cuticular papillæ.

On removing the first pair of scales, the head appears as a well-marked rounded eminence, with two distinct black eyes near the anterior border dorsally. Beneath each is a much larger eye, which occupies the anterior ventral edge of the head, and looks downward and outward. It is not visible from the dorsum. The posterior region of the head is covered by the nuchal fold. At the anterior border a winged tentacular base, nearly as broad as the head, extends forward, diminishing gradually to its articulation with the filiform tentacle, the extremity of which reaches the tips of the bristles of the first foot. The wing on each side of the tentacular base may represent a modified antenna. The palpi are short and small, barely reaching the tip of the last mentioned bristles. Their surface is smooth, with the exception of a few blunt papillæ on the filiform tip. The first foot carries a slender tapering cirrus on its outer edge, and inferiorly a shorter process of the same kind. The extremity of the former reaches the tip of the bristles.

The first pair of scales (Pl. XXII. fig. 4) entirely differs from the others, being prow-shaped. Moreover, the right considerably overlaps the left, and is more elongated

from before backward. The general outline of these scales is somewhat triangular, with a deep groove bordered by an elevation at each side on the anterior border. Almost the entire margin is surrounded by cilia. In the arrangement of the sandy, and other grains on the dorsum of each, it is observed that a somewhat regular gradation occurs from before backward, the finer particles occurring anteriorly and the coarse posteriorly. They are also less affected by the ferruginous hue than the succeeding. The other scales generally are coated externally by a ferruginous deposit, over which the sand-grains are attached. The anterior margin alone is free from the latter, and is also smooth; while the rest of the margin is surrounded by a dense series of cilia, which are longest on the inferior border, where they likewise show a tufted arrangement on slight elevations, the intermediate spaces having short papillæ (Pl. XXIV. fig. 6), as Grube indicates in *Psammolyce umbonifera*.[1] The surface of the scale appears to be covered with distinct papillæ, almost all, however, being shrouded in sand-grains and ochreous mud. The scales are proportionally larger than in the previous form, and they readily fall off.

Each foot has a well-marked branchial process superiorly, and long slender cilia (papillæ) along the external and inferior borders. These processes are longer than in *Psammolyce sombreriana*. The ventral cirrus extends beyond the base of the bristles. The superior division of the foot bears a dense tuft of curved serrated bristles, generally coated inferiorly with the ochreous deposit; and internal to their base is a well-marked lamellar collar.

The ventral lobe has a series of brownish bristles with an elongated, bifid, terminal process articulated distally in the usual manner (Pl. XIIIa. fig. 18, an intermediate form). On the whole, the terminal appendages are longer than in the last species.

The leading differences, therefore, between this form and *Psammolyce sombreriana* are—the more prominent head, the presence and position of the eyes, the large size and structure of the basal segment of the tentacles, the more evidently spinous condition of the dorsal bristles, the greater comparative length and the structure of the tips of the ventral bristles, the more elongated papillæ on the feet, the ferruginous deposit, and the substitution of sand-grains for Foraminifera on the scales.

The differences just noted in external characters are fully borne out by an examination of the structure of the body-wall. The surface shows a dense extraneous deposit, which often envelops the papillæ in a continuous mass, and the cuticle ventrally is proportionally thicker. The nerve-area, while following the same type, is deeper and narrower, and the ventral longitudinal muscles show only a gentle curvature. The dorsal longitudinal muscles are also proportionally thicker inferiorly. In ordinary sections there is a deep median furrow between the cords superiorly, a feature intensified by the parting of the oblique and vertical muscles in the same region.

[1] Annelidenausbeute von S.M.S. "Gazelle," *op. cit.*, p. 521.

Leanira, Kinberg.

Leanira magellanica, n. sp. (Pl. XXI. fig. 7; Pl. XXIII. fig. 13; Pl. XXV. figs. 6, 7; Pl. XIIIA. figs. 19, 20).

Habitat.—Two fragmentary specimens were trawled at Station 306A (in the Strait of Magellan), January 2, 1876; lat. 48° 27′ S., long. 74° 30′ W.; depth, 345 fathoms; bottom temperature 46°·0, surface temperature 57°·5; sea-bottom, blue mud.

A species of considerable size, the larger fragment measuring 77 mm. in length and about 7 mm. in breadth.

The head has a peculiar mottled iridescent appearance, is rounded and devoid of eyes. The tentacle, arising anteriorly from an enlarged base, is a filiform and elongated organ. It is, however, only about a fifth the length of the palpus. Close by the base on each side is a short and somewhat spathulate organ, which may be the homologue of the antenna. There are two tentacular cirri superiorly on each side and two inferiorly, the outer in each case being the longer. The palpus is smooth and extremely long, reaching beyond the tip of the extruded proboscis. The latter presents eleven papillæ dorsally, and the same number inferiorly, and its upper surface is marked by three longitudinal muscular bands pertaining to the first region of the alimentary canal. The maxillæ do not appear to present features of diagnostic importance.

The scales (Pl. XXV. fig. 6) are soft, semitranslucent, and of considerable size. Their general form is somewhat ovoid, and their outline perfectly smooth. Behind and below the scar of attachment is a granular mass from which nerve-branches radiate to all parts of the scale. The surface of the scale is studded with rather large isolated papillæ as well as groups of papillæ which give a peculiar character to the organ. The large free papillæ occur on the space below and behind the umbilicus, while the conglomerate affect the marginal region, from the upper border posteriorly to the anterior border inferiorly. They are most abundant in the latter region. When fully formed the scales would appear to cover the back entirely.

Each foot has superiorly a well-marked branchial process, and three ciliated pads, a small one beneath the former organ, followed by an elongated closely attached one, while a more prominent pad occurs at the base of the dorsal division of the foot. The preparations, unfortunately, have been too much injured to give a perfect view. Several elongated and tapering papillæ are attached to the tip of the dorsal division of the foot, and the free margin of the lower division has numerous processes of the same kind, a clear space, however, intervening between the last and the ventral cirrus. The latter is proportionally larger than in *Psammolyce* and *Sigalion*, and its tip extends as far outward as the setigerous lobe, and therefore considerably beyond the base of the bristles.

The dorsal bristles of this form are less slender and elongated than in *Leanira*

tetragona. They proceed from the superior lobe in a fan-shaped manner, and show the usual whorls of spikes.

The bristles of the inferior division may be grouped, as in *Sigalion*, in three sets, a superior, middle, and inferior. The superior and inferior are more slender, especially the latter, and have a much more elongated tapering tip, which presents more minutely marked canaliculi (Pl. XIIIA. fig. 19). Unfortunately very few of the tips of the median bristles (Pl. XIIIA. fig. 20) are discoverable, the majority having fallen off, so that the series usually presents a truncated brush-like margin in the anterior region.

In transverse section the body-wall agrees for the most part with *Leanira tetragona*, as shown by Dr. Hansen.[1] The cuticle is somewhat thick ventrally, and the hypoderm is thin. The ventral longitudinal muscles are folded externally and superiorly, and in some there would appear to be a faint spiral arrangement. No fold exists in the dorsal longitudinal muscles. The nerve-area is covered by the oblique and vertical muscles. The cords are somewhat flattened or ovoid, and in some preparations a median canal inferiorly is indicated, but the specimen is too imperfectly preserved for minute characters. The proboscis presents the ordinary structure, and in extrusion still keeps cuticle and hypoderm internal, with the radiate coat external. The ridge at each pole is well marked.

Leanira areolata, n. sp. (Pl. XXI. fig. 3; Pl. XXV. figs. 8, 9; Pl. XIIIA. fig. 1).

Habitat.—A single complete specimen was procured at Station 232 (south of Yedo, Japan), May 12, 1875; lat. 35° 11′ N., long 139° 28′ E.; depth, 345 fathoms; bottom temperature 41°·1, surface temperature 64°·2; sea-bottom, green mud.

The example is about 150 mm. in length, and its diameter at the thickest part anteriorly is 9 mm.

The head (Pl. XXI. fig. 3), as in the former case, is eyeless and mottled in the same peculiar iridescent manner. The tentacle is attached to a somewhat conical base which comes from the front of the head. On each side of the base is a small spathulate process. The tentacular cirri do not present any feature of note. The palpi are long, smooth, and delicately tapered.

The first scale is small, rounded, and quite smooth. It presents the same granular nervous mass and ramifications as in the succeeding. They rapidly increase in size, and in the preparation almost cover the dorsum anteriorly. They are soft, whitish, slightly translucent, and anteriorly quite smooth on both surface and margin. Behind the anterior third the fold on the outer margin presents a series of simple and very slightly tapered papillæ (Pl. XXV. figs. 8, 9), and since they are usually invisible on running the eye round the margin, they have as a rule to be looked for carefully. Minute examination,

[1] Anat. von Leanira tetragona, *Archiv f. Math. og Naturvidenskab.*, Christiania, 1878.

moreover, shows that the outer border in the anterior scales is very prettily marked by regularly arranged areolæ. The great nervous ganglion (situated behind and somewhat exterior to the umbilicus) and its branches are seen with remarkable clearness in this species (Pl. XXV. fig. 8), and are worthy of minute study. The general surface of the scale is granular by transmitted light.

The first foot, as usual, is directed straight forward, and bears on the superior division a long tuft of tapering bristles which are only distinctly serrated in the upper series of the group. The rest are much more minutely hispid toward the tip. The inferior division, again, has a similar long tuft of tapering bristles, but the serratures, if present, are barely discernible. Both groups are thickly studded with somewhat large clear globular bodies, apparently of a fungoid nature.

The second foot (which carries the first scale) puts on the character of the posterior to a greater or less extent. The dorsal branch has a group of very long papillæ (about five in number). Only the bristles nearest the body, however, are distinctly serrated. The inferior division shows bristles with the usual canaliculated tips, though they are more slender than those which follow.

The third foot, as in the former species and other *Leaniræ*, bears the long and characteristic cirrus, which stretches considerably beyond the tip of the first foot in a line straight forward. It is an elongated, smooth, tapering process, and has at its base externally a globular enlargement. The precise homologies of this process are interesting. It quite differs from that found in *Sthenelais* and *Sigalion* (for in the latter genera this segment bears only a minute process attached to the external border of the dorsal tubercle). If the external enlargement of the basal region represent the dorsal tubercle in the other forms usually associated under the Aphroditidæ of Savigny, Audouin and Edwards, Grube, and others (that is using the term in its widest sense), then the long cirrus on the third foot of *Leanira* is not homologous with the succeeding branchial ones, which arise from the exterior of the dorsal tubercles for the scales. In the Polynoidæ, for instance, the dorsal cirri spring from a point altogether external to the tubercles.

When the feet are fully formed the dorsal bristles are similar to those in *Leanira magellanica*. The ventral bristles (Pl. XIIIA. fig. 1) are longer than in the latter form, and thus they and the dorsal are more nearly equal in length. Moreover, while the shafts are somewhat longer than in *Leanira magellanica*, the tips are, comparatively, somewhat shorter. A well-marked branchia, richly ciliated inferiorly, occurs on every foot, and bears ventrally a process at its base like a diverticulum. In one or two instances a branch as long as the branchia takes origin from the latter. The same arrangement of ciliated pads occurs as in *Leanira magellanica*, viz., one under the branchia, a second long one, and a third broadly clavate or fan-shaped process on the dorsum of the foot.

Between the feet, and stretching upward toward the dorsal median line, are many minute commensalistic bodies resembling Infusoria, but apparently Rotifera. They are somewhat ovoid and nearly sessile. Along the ventral median line are numerous small pure white masses under the skin, which show a vast aggregation of distinct cells of equal size, ovoid in outline and containing a granular organism (apparently embryonic internally). The masses appear to be similar to those which occurred in *Nychia cirrosa* from Greenland.

In transverse section the body-wall presents certain peculiarities. The dorsal longitudinal muscles form a thin layer superiorly, but inferiorly are lobate and massive. The ventral longitudinal muscles are thinner, and more expanded than in the previous species, and the superior fold at the outer border is also elongated and flattened. The nerve-area is wide, and an oblique slit occurs at the inner border of one of the nerves. The proboscis shows on each side of the polar ridge a peculiar curvature, apparently due to the acuteness of the ridge. The hypoderm of the organ is dense and somewhat brownish (?). Attached to the base of a foot in one example was the following Crustacean parasite. A similar form was found on *Leanira hystricis* from the south-west of Ireland.

Leaniricola rotundata, n. gen. et sp.

The outline of the cephalo-thorax of this form is peculiarly rounded (woodcut, Fig. 2) the cephalic region, however, being distinctly indicated by an interior central projection or rostrum, and a lateral notch on each side. The anterior antennæ have in addition to the usual fine hairs stout curved processes, consisting of the ordinary coats of the antennæ, and which give the organs a somewhat branched appearance. The second pair of antennæ seem to be minute, probably about the length of the three terminal segments of the first pair, and formed apparently of three or four segments, the terminal being furnished with long spinous processes. The mouth-organs present an arrangement similar to that in *Nereicola*. Three pairs of limbs are visible, two larger anterior, and the rudimentary third process observed on the side of the body posteriorly. The first pair are minute, the basal portion giving attachment to two short and rather broad limbs, each of only two segments. The terminal division of the longer limb has three short, claw-like, spinous processes on one side, and four longer and more delicate spines on the other. A single curved spinous process occurs on the first division of the limb. The shorter limb presents a

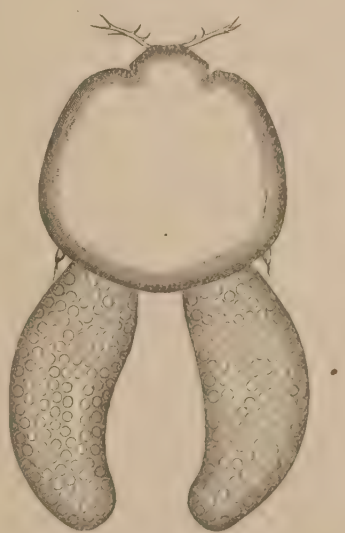


Fig. 2.—*Leaniricola rotundata*, n. gen. et sp., parasitic upon *Leanira areolata*.

single curved spinous process at the tip, and three long, delicate spines. The abdominal region is curved under the body, and shows about five segments, the last being bifid. Each of the divisions of the terminal segment bears a clavate style, furnished with a few fine hairs. The tips of the styles, indeed, are almost globular. The ovigerous sacs exceed the length of the body, and form large sausage-shaped processes filled with ova. The body of the specimen is also filled with ova. The genus is characterised by the shape of the body, the structure of the antennæ, and the form of the feet and post-abdomen.

Leanira japonica, n. sp. (Pl. XXII. fig. 3; Pl. XIVA. figs. 1, 2).

Habitat.—Dredged off Kobé, Japan, in 8 to 50 fathoms.

A small and fragmentary specimen, having a diameter, including the bristles, of 3 mm.

The head (Pl. XXII. fig. 3) is proportionally large, and for the most part tinted by pale reddish-brown pigment. Two very conspicuous, round, black eyes are situated towards the front of the head, just behind the tentacle, and from each a pale band passes backward. Another pair occupy the inferior surface of the snout beneath the tentacle, the pigment being somewhat crescentic in shape, probably because a "lenticular" structure is present. The latter eyes look downward and forward. The tentacle is a simple tapering process, and on each side of its basal region is the spathulate appendage. The palpi are of moderate length, smooth, and finely tapered.

The scales are absent. So far as can be observed, the structure of the first and other feet is normal. Each foot (when fully developed) has a well-formed branchial process superiorly, but the preparation is so injured that no reliable observations can be made concerning the ciliated pads. The dorsal division bears the usual slender serrated bristles, the upper being more distinctly, and the lower less distinctly, spinous. At their base are several long cuticular papillæ.

Anteriorly the ventral group occasionally presents superiorly a single bristle with whorls of spikes (Pl. XIVA. fig. 1), which has not hitherto been observed in other species of *Leanira*. The rest of the bristles are translucent, less differentiated into a slender superior and inferior series, and with a stouter median group than in the previous species (Pl. XIVA. fig. 2, one of the upper and larger examples). The canaliculated tip is of moderate length, and the markings well defined. The inferior bristles have shorter tips. The extremity of the ventral cirrus extends to the base of the bristles. This division of the foot also has numerous and rather translucent papillæ.

In transverse section the ventral longitudinal muscles show a largely developed dorsal fold, and their inner angles appear to approach each other somewhat closely, so that the area is narrowed superiorly. The hypodermic region of the proboscis and its two nerves on each side are well marked.

Leanira hystricis, Ehlers (Pl. XXIII. fig. 9).

Leanira hystricis, Ehlers, Ann. and Mag. Nat. Hist., ser. 4, vol. xiii. p. 292, *et infra*.
Leanira hystricis, M'Intosh, Trans. Zool. Soc. Lond., vol. ix. p. 408.

Habitat.—Two fragmentary examples were dredged at Station 73 (to the west of the Azores), June 30, 1873; lat. 38° 30′ N., long. 31° 14′ W.; depth, 1000 fathoms; bottom temperature 39°·4, surface temperature 69°·0; sea-bottom, Pteropod ooze.

A third fragment without a head occurred at Station 76 (off the Azores), July 3, 1873; lat. 38° 11′ N., long. 27° 9′ W.; depth, 900 fathoms; bottom temperature 40°·0, surface temperature 70°·0; sea-bottom, Pteropod ooze.

The same form was found at Station 7 in the "Knight Errant," August 12, 1880; lat. 59° 37′ N., long. 7° 19′ W., in 530 fathoms.

These specimens are larger than any procured in the "Porcupine," off the south-west coast of Ireland, and examined by Ehlers or myself. Ehlers refers to one (probably his largest) 19 mm. in length and having a breadth of 2 mm., including the bristles, whereas the longer example from the first Station was 42 mm. in length, and with the bristles had a diameter of 3·5 mm.

The publication of a complete description with figures by Ehlers,[1] since my former note,[2] enables a more minute comparison to be instituted. The larger examples procured in the Challenger also show certain points more clearly than in any previous specimen. The figure of the head, tentacle, and upper tentacular cirri given by Ehlers deviate considerably from my former description and the parts in the examples just named. The processes (tentacle, &c.) are too large, and the distal undulations too pronounced. The tentacle does not taper sufficiently at the distal end. The anterior scales are also somewhat less than in Ehlers' figure. Both the first and second scales are small and rounded.

Ehlers observes that the species approaches the *Leanira quatrefagesi* of Kinberg,[3] from the Atlantic, off the Rio de la Plata. A more minute investigation of Kinberg's specimen, indeed, is necessary before all doubts as to the specific separation are removed. They closely agree in regard to the structure of the scales, bristles, and general condition of the head and its processes, and seem to differ chiefly in regard to the structure of the feet, and in the absence of eyes in *Leanira hystricis*, a pair being present in the other form.

In transverse section the specimen from Station 73 quite differs from the other in regard to the nerve-area, which is elongated and flattened, the oblique muscles being attached to the outer angles only. The cuticle is comparatively thick ventrally. The ventral longitudinal muscle is flattened and the dorsal fold thin. The nerve-cords are flattened. There is a distinct elevation or thickening on each side of the polar ridge of

[1] *Zeitschr. f. wiss. Zool.*, Bd. xxv. p. 35, Taf. ii. figs. 5–11, 1875.
[2] *Trans. Zool. Soc. Lond.*, vol. ix. pt. vii. p. 408, pl. lxxiii. figs. 6–8.
[3] Freg. Eugen. Resa, &c., p. 30, Taf. ix. fig. 42, &c.

the proboscis. In the example from Station 76, the ventral area is much deeper and narrower, a feature, however, due to the condition of the opaque accessory regions above the nerves, the parts being minutely cellulo-granular in certain sections, while in others the spaces (canals?) are distended with large elliptical corpuscles, the precise nature of which has not yet been determined, the narrow apex in all being completely occupied by the oblique and other muscles. The nerve-cords are somewhat ovoid, and have a neural canal at their inner border. The cuticle is very thin. The ventral longitudinal muscles are thicker and rounder in section, and the dorsal fold is thick, with a short point. The dorsal longitudinal muscles are also much thicker than in the former specimen. How far these characters are due to the difference of region would require to be ascertained, but they seem to be worthy of note.

Leanira lævis, n. sp. (Pl. XX. fig. 4; Pl. XXIII. figs. 10, 11).

Habitat.—Dredged in Queen Charlotte Sound, at a depth of 10 fathoms.

The fragment appears to belong to a species of considerable size. The diameter, including the bristles, is 4 mm.

The head has a long median tentacle, with the usual spathulate processes on each side of the base. Slightly external and posterior to the latter is a small black eye; while on the smooth eminence on each side of the snout, immediately beneath the tentacle, is a much larger eye, the pigment of which is somewhat above the lenticular region. This seat of the eyes in the *Leaniræ* seems to have been hitherto unobserved. The tentacular cirri are not so long as the tentacle. The palpi are rather less elongated than usual. In contrast with the species from the Gulf of St. Lawrence[1] alluded to formerly, the head of this form is somewhat smaller and more rounded, that in the former being transversely elongated. The first foot bears a tuft of very delicate iridescent bristles, which project conspicuously forward.

The first and second scales are smaller than the succeeding, and all are delicate and translucent. They are perfectly smooth in outline and surface, the granules of the hypoderm alone showing by transmitted light (Pl. XXIII. fig. 10). They meet in the centre of the dorsum in the preparation, after the termination of the proboscidian region. A well-marked granular ganglionic mass appears behind the umbilicus. There is little in the scales to distinguish this from the before-mentioned species.

The superior division of the foot has a branchial process, the usual three dorsal pads, a number of long papillæ on the inner side of the base of the dorsal bristles, and a much larger and slightly pedicled process beneath the latter. The dorsal bristles consist of the ordinary kinds, some having distinct whorls of spikes, others being almost smooth.

[1] *Ann. and Mag. Nat. Hist.*, ser. 4, vol. xiii. p. 268, 1874.

The ventral division bears a tuft of long papillæ at the base of the upper bristles, and a single one near the inferior edge of the anterior border. None occur on the ventral margin. The ventral cirrus exhibits a process on the distal side of its base, with an enlargement beyond it, and the tip is jointed. The ventral bristles are translucent but somewhat stout, the stronger forms occurring superiorly, and only a few at the ventral border having slender shafts and longer tips. The tips of the upper series are comparatively short, and there is a peculiarly wide wing-like margin on each side of the central canaliculated region.

Compared with the anterior foot of the *Leanira* from the Gulf of St. Lawrence, the dorsal fascicle of bristles is much shorter, and the papillæ at their base more numerous. The ventral bristles have somewhat shorter and stouter shafts and shorter tips, and the papillæ of the setigerous lobe are much longer. The ventral cirrus is shorter, less tapered, and has a process at its base, and generally an enlargement about its middle.

In this species the cuticle corresponds with that in *Leanira hystricis*, being thickened ventrally, especially in the middle line, and comparatively dense all over. The form of the dorsal longitudinal muscles also agrees with the species mentioned. The ventral longitudinal muscles, on the other hand, are small and ovoid, the external superior fold passing more than half way inward. The nerve-area seems to be proportionally deeper than in *Leanira hystricis*, and the hypoderm externally more distinctly differentiated. A neural canal exists on the inner (and inferior) side of each nerve. Externally, under the insertion of the oblique muscles, is an opaque region, which varies in appearance according to the line of section, just as the insertions of the oblique muscles appear to do. The proboscis corresponds in structure with the species above noted.

Eupholoë, M'Intosh.

Body elongated, somewhat truncated in front, and tapered posteriorly, the former end being covered with coarse, and the latter with fine, sand-grains. Elytra small, confined to the lateral regions, and furnished with peculiar processes, which, like the other parts of the scales, are covered with long cilia. A rudimentary branchia (?) on each foot. Dorsal bristles slender, with long spinous rows; ventral with a single, short, terminal process, beneath the hook of which is a minute spine.

Eupholoë philippinensis, n. sp. (Pl. XXII. figs. 6, 7; Pl. XXIV. fig. 7; Pl. XXV. fig. 10; Pl. XIIIA. figs. 16, 17).

Habitat.—A single example was trawled at Station 201 (Basilan Strait, off Mindanao, one of the Philippines), October 26, 1874; lat. 7° 3′ N., long. 121° 48′ E.; depth, 82 to 102 fathoms; surface temperature, 83°·0; sea-bottom, stones and gravel.

The example is about 19 mm. in length and 2·6 mm. in breadth.

The dorsum (Pl. XXII. fig. 6) is covered with rather coarse grains of sand, and a few Foraminifera throughout a considerable part of the anterior region. The succeeding part has much finer grains, less densely aggregated, while the terminal region again has coarser grains, though not quite so coarse as in front. The ventral surface is minutely papillose, the anterior region, indeed, being villous. The feet appear to be upwards of seventy on each side. The grains of sand are removed with much difficulty, the first two scales separating with the efforts.

The head (Pl. XXII. fig. 7) is much more concealed than in *Pholoë*, as well as smaller, the nuchal fold passing over it posteriorly. A pair of very distinct blackish eyes occurs, one on each side of the base of the tentacle; and on the under surface of the head, immediately beneath the foregoing, is another and much larger black eye on each side. The latter is invisible from the dorsum. A filiform tentacle proceeds from the anterior margin of the head, and a stouter pair of tentacular cirri on each side of it. The palpi are short and tapering, and resemble those of the *Pholoë minuta*.

The coarse sand-grains in front prevented a minute investigation of the position of the scales, but, so far as could be observed, they only cover the sides of the body as in *Pholoë*, *Psammolyce*, and allied forms. In structure they are very remarkable (Pl. XXIV. fig. 7), for in addition to a coating of long papillæ, generally filiform and tapering, though some are distinctly clavate, there is a long process (like a handle) at the anterior and inner angle, in the attached condition, but, as shown in the figure, nearly in the centre of the inner border in the free scale. The latter appendage has similar cilia (Pl. XXV. fig. 10), a long series of which project beyond the tip. The anterior margin of the scale only is bare. In the first pair of scales the process and its cilia are not distinctly developed.

The general form of the foot agrees with that in allied species. The dorsal division bears a dense series of very fine bristles, which differ from those of its allies in having much longer spinous rows (Pl. XIIIA. fig. 16).

The ventral division, again, has a series of light straw-coloured bristles (Pl. XIIIA. fig. 17, one from the central region) which possess a simple terminal process, the latter as usual being longer superiorly and inferiorly on the more slender bristles. The distal end of the shaft in the superior series exhibits a few spinous rows, and there are traces of them in the inferior bristles. At the base of the terminal hook of the distal division is a small tooth, which may be an indication of the secondary process so common in *Psammolyce*, *Sthenelais*, and others.

The foot has numerous long papillæ, often clavate at the tip, on its surface. The ventral cirrus shows an enlargement at the base externally, and internally several long papillæ. The slender tip is nearly cylindrical for a considerable distance and truncated. A rudimentary branchia, in the shape of a small process, is attached to the external margin of the pedicle for the scale, and to the intermediate feet.

The specimen is a female with several large ova occurring at the bases of the posterior feet.

This form agrees with *Pholoë* in the general arrangement of the scales on the feet, and in the general character of the bristles. It differs in the position of the second pair of eyes, in the structure and size of the scales, the presence of the rudimentary branchiæ, and other points. It seems to be intermediate between the former and *Psammolyce*, with which it corresponds in the condition of the dorsum and the fimbriated state of the scales, as well as in the position of the inferior pair of eyes.

The cuticle is very dense all over the body-wall, and covered with numerous filiform papillæ. A mere trace of the hypoderm is continued outward from each side of the nerve-area. The latter is bounded superiorly by the oblique muscles, beneath the insertions of which a canal is seen on each side of the middle line. The area is narrower below than above, since the broad edge of the ventral longitudinal muscle slopes upward and outward. The outer edge of the same muscle is rounded, and appears to have a rudimentary superior fold. The rest of the muscle in section is nearly straight. The dorsal longitudinal muscles almost meet in the middle line, and their fasciculi are distinctly pennate in arrangement. The hypoderm of the proboscis does not show a noteworthy enlargement on each side of the median (polar) ridge. The thick inner edge of the ventral longitudinal muscle probably aids in deepening the nerve-area.

Family Nephthydidæ.

Comparatively few species of this family occur in the collection, and yet they are by no means uncommon at great depths, though they are likewise prominent members of the shallow water and shore faunæ. The largest and most abundant is *Nephthys trissophyllus*, Grube, from Kerguelen, where it was first procured by the German exploring ship "Gazelle." The latter altogether collected three species, whereas five were dredged by the Challenger. One form only is described by Grube in his Annulata Œrstediana, and none appear in his Philippine series. Kinberg found four species of *Nephthys* in his celebrated voyage, besides two new genera, each with a single species, and an example of *Portalia*, De Quatrefages.

As a rule, the members of the family inhabit sand.

Nephthys, Cuvier.

Nephthys trissophyllus, Grube (Pl. XXVI. figs. 1, 2, 3, 4, 5; Pl. XXVII. figs. 1, 4; Pl. XXX. fig. 8; Pl. XIVA. figs. 9, 10, 11).

Nephthys trissophyllus, Grube, Monatsber. d. k. Akad. d. Wiss. Berlin, v. Aug. 1877, p. 533.

Habitat.—Dredged somewhat abundantly off Kerguelen Island, at Station 149. They are particularly numerous from Accessible Bay, January 9, 1874; lat. 49° 8′ S.,

long. 70° 12′ E.; in from 20 to 25 fathoms; sea-bottom, volcanic mud; and again on January 13, 1874, in 25 to 30 fathoms. A single specimen (about one-third grown) occurs from Balfour Bay (Station 149c), January 19, 1874; depth, 60 fathoms; and a similar example, labelled "Royal Sound," was dredged on the following day.

The two largest specimens were dredged at Station 151, February 7, 1874 (off Heard Island); lat. 52° 59′ S., long. 73° 33′ E.; depth, 75 fathoms; surface temperature, 36°·2; sea-bottom, volcanic mud.

The large specimens, which greatly exceed Professor Grube's, measure 220 mm., with a diameter of about 20 mm. anteriorly.

The outline of the body agrees with the typical forms, and the general colour of the larger specimens is iridescent, dull brownish in front, paler posteriorly, or dull iridescent, violet anteriorly, and somewhat paler posteriorly. The smaller examples are pale.

The head is somewhat shield-shaped with the point posterior, and a small pit exists on each side, a little in front of the latter. The tentacles and subtentacles are short and conical. The exserted proboscis (Pl. XXVI. fig. 4) forms a short thick cylinder with a distal division terminated by a prominent series of double papillæ, ten on each side. The central hiatus superiorly is occupied by a single shorter papilla, while the ventral hiatus has a short bilaterally divided papilla, the other ten being split radially. Fissures run down between each of the double papillæ internally, and the somewhat dense mucous membrane is cut into various areolæ, which in a modified form may foreshadow the mouth of the Lamprey. Externally the furrows pass to the base of the distal division. The succeeding and larger region is ovo-cylindrical, and its surface is furnished with a number of prominent papillæ, which, with the exception of the median parts dorsally and ventrally, are rather irregularly arranged distally. By and by the papillæ diminish in size, and towards the base group themselves into fourteen rows, which proximally are bifid. The two horny conical jaws are similar to those in *Nephthys cæca*, and are largely developed.

The superior lamella of the foot (Pl. XXVII. figs. 1, 4) is broad as well as elevated, and is rounded all along the free margin. The next lamella springs from the base of the branchia, and widens so as to assume a broadly ovate shape with a pointed apex. The inferior lamella is ovato-lanceolate, and in the larger examples is much developed. In young specimens all the lamellæ are larger and as a rule more perfect, and in a variety from Royal Sound (Pl. XXX. fig. 8) these are unusually large. The cirriform branchial process is coiled inward, and in several is the seat of a minute parasitic Nematoid, which has a blunt snout and a pointed tail. The latter shows a series of about nine regular loop-like markings above the anus. The

occurrence of Nematoids in such positions is by no means common. The ventral cirrus is large and lanceolate, and at the base of the ventral lamella superiorly is a short conical cirrus.

The short anterior bristles (Pl. XIVA. fig. 9) are boldly barred transversely. They are straight and regularly tapered, but present comparatively few points of decisive specific distinction. The longer forms (Pl. XIVA. fig. 10) are slender, gently curved, and have the convex edge covered with minute spikes. Some of the examples from Kerguelen present posteriorly stouter and darker long bristles (Pl. XIVA. fig. 11), with a slightly different curve. The serrated region is decidedly shorter, while the shaft is longer.

Besides the parasitic Nematoids, the branchiæ are the seat of many *Loxosomæ*, while the long bristles abound with a short thecate Infusorian as in the British and other forms.

The muscular rugose alimentary canal of the larger specimens was empty, but in others mud, rich in sponge-spicules, Radiolarians, Diatoms, and the bristles of Annelids (Spionidæ) occurred.

In the structure of the body-wall this species in the main agrees with *Nephthys cæca*, Fabr., though the dorsal longitudinal muscles are less bulky inferiorly, in transverse section. The ventral longitudinal are also less massive. The ventral area is proportionally larger, and the combined oblique and vertical muscles do not form so complete an arch as in *Nephthys cæca*. The hypoderm, as in the latter, seems to be wholly external. The nerve-trunks are large, and each has an internal (*i.e.*, near the median line) neural canal of considerable size. In some sections smaller canals appear above the former, but such may be due to imperfect preservation.

The proboscis seems to agree with typical forms—having its cuticular and hypodermic layers internally, and its radiate fibres externally—much after the plan of that in the Polynoidæ, only there are no distinct folds at the poles. The horny teeth are cuticular.

Professor Grube's examples were procured at Kerguelen by the German exploring ship "Gazelle." A specimen in the British Museum, also from Kerguelen (75, 7, 15, 4), is labelled (by Grube in 1876) simply *Nephthys*. It had not been forwarded previously for examination with the other Annelids from the same region.

Nephthys dibranchis, Grube (Pl. XXVI. figs. 8, 9; Pl. XXVII. fig. 5).

Nephthys dibranchis, Grube, *op. cit.* (S.M.S. "Gazelle"), p. 536, 1867.

Habitat.—Dredged in the Arafura Sea, south of New Guinea. Professor Grube's specimen came from the same region.

The specimen is fragmentary, but is larger than Grube's, measuring 30 mm. in length and about 3 mm. in diameter.

The head (Pl. XXVI. fig. 8) is shield-shaped, with a rounded posterior border, at which are a pair of small black eyes. The tentacles and subtentacles are short and conical. The proboscis is partly extruded in the preparation, and just in front of the head are a pair of muscular loops which are fixed to its base, and probably have burst through. The proboscis has numerous rather long papillæ. The foot (Pl. XXVII. fig. 5) has superiorly a somewhat elevated lamella with a bluntly rounded free margin. The upper lobe is triangular, with a short tapering cirrus at the commencement of the branchia. The latter has an enlargement a little beyond its base exteriorly, and it is coiled inwards. The inferior lobe projects somewhat farther than the superior, and from its upper edge a branchial process, considerably less than the dorsal one, is directed upward. Like the other, its margins are crenate and ciliated. The lobe proper is somewhat trifid, for an ovate process occurs at the base of the branchia, the centre is occupied by the spine, and a small ovoid lamella projects between the latter and the ventral cirrus. The latter is dilated above the base, tapered towards the tip. There is little diagnostic in regard either to the shorter barred bristles or the longer serrated forms. At the bases of the latter are certain peculiar bifid types, which appear to be due to fractured bristles with tips in process of regeneration. The nerve-area in this form is wedged between the ventral longitudinal muscles at the sides, the oblique and vertical above, and the hypoderm inferiorly. It is more closely environed than in *Nephthys cæca* or the previous form.

A similar species (*Nephthys jeffreysii*, n. sp.) comes from Japan, lat 33° 56′ N., long. 130° 27′ E., where it was dredged by Captain St. John. The structure of the foot, however, shows a characteristic divergence. Instead of being rounded, the superior lamella has a nearly straight upper edge, the tip is pointed, and the external border convex. The superior lobe of the foot is less produced than in the foregoing, the cirrus at the base of the branchia is symmetrically dilated at the base, and thereafter forms a nearly cylindrical process. The branchial organ is both shorter and more slender, and the enlargement a little beyond the base externally very prominent. The inferior lobe is very short, presenting superiorly a short, straight, branchial process which extends a little beyond the tip of the lamella beneath, which is somewhat conical. The ventral cirrus is broadly fusiform at the base, and slender distally.

De Quatrefages, from the somewhat ambiguous figure of O. F. Müller,[1] supposed that he had to do with a new type with two branchiæ, and constituted the genus *Diplobranchus*. The structure of *Nephthys ciliata*, however, quite differs from the foregoing.

[1] Zoologia Danica, Tab. 89, figs. 1–4.

Nephthys verrilli, n. sp. (Pl. XXVI. figs. 6, 7; Pl. XXXIIa. fig. 8).

Habitat.—Dredged at Station 167A (Queen Charlotte Sound), June 27, 1874; lat. 41° 4′ S., long. 174° 19′ E.; depth, 10 fathoms; surface temperature, 51°·5; sea-bottom, mud.

A comparatively small species, the examples measuring about 14 mm. in length, and having a diameter of 2·5 mm.

The head (Pl. XXVI. fig. 6) is considerably elongated from before backward, and has near the posterior border a pair of small black eyes. The tentacula and subtentacula are proportionally large. In extrusion the proboscis (fig. 7) presents twenty-two rows of papillæ, which diminish from the distal region to the base. There are eleven distal papillæ, the median dorsal being single, while the median ventral is laterally bifid instead of radially, as in the others.

The foot (Pl. XXXIIa. fig. 8) bears superiorly a moderate lamella, which has a greater horizontal than a vertical diameter. It is less erect than in *Nephthys dibranchis*, Grube, and its external (or inferior) curve is longer. The cirrus at the base of the branchia has a larger basal and a more slender distal region than in the latter. The branchia has a basal protuberance externally, is proportionally large, and coiled inward. The ventral lobe has superiorly a small branchia, which is often curved inward. A bluntly conical lamella occupies the space between the latter and the ventral cirrus, and the arrangement thus differs from that in *Nephthys dibranchis*. The ventral cirrus is expanded inferiorly and tapered distally. The superior and inferior bristles are long and finely tapered, and they likewise have a well-marked curve. In the inferior series there are many shorter and less attenuate forms with bold curves. The short-barred bristles show no distinctive features.

Though thus widely differing in habitat, this species closely approaches *Nephthys dibranchis* from the Arafura Sea.

In transverse section the nerve-cords are found to be enveloped even more closely than in *Nephthys dibranchis*, Grube, and they appear to be proportionally smaller. The cuticle is comparatively thick, but the hypoderm is slightly developed. No neural canal is visible. The ventral longitudinal muscles are bilobed in section, each side forming an ovoid mass of muscle. The proboscis and other parts follow the typical structure.

This form somewhat approaches the *Nephthys atlantica* of Hansen[1] from the North Atlantic, but it is readily distinguished both from this and the new species (*Nephthys minuta*) described by Théel[2] from the Kara Sea, by the presence of the inferior branchia.

[1] Den norske Nordhavs-Exped., p. 31, pl. iv. figs. 1, 2.
[2] Annél. des mers Nouvelle-Zemble, p. 28.

Dr. Hansen's description of *Nephthys atlantica* is brief and rather indefinite, but his figure is useful.

Nephthys phyllobranchia, n. sp. (Pl. XXVI. fig. 10; Pl. XXVII. fig. 3; Pl. XIVA. figs. 12, 13).

Habitat.—Dredged at Station 45 (off the American coast, a little south of New York), May 3, 1873; lat. 38° 34′ N., long. 72° 10′ W.; depth, 1240 fathoms; bottom temperature 37°·2, surface temperature 49°·5; sea-bottom, blue mud.

The softened fragmentary specimen measures in length about 50 and in breadth 4·8 mm., and is therefore of considerable size.

The head (Pl. XXVI. fig. 10) is somewhat quadrate, eyeless, and with a pit at each side posteriorly. The extruded proboscis has unusually prominent longitudinal fibres. The papillæ are grouped towards the distal end, and are closely arranged. They commence as short processes, but abruptly become rather large and long.

The feet (Pl. XXVII. fig. 3) throughout are characterised by the closeness with which their superior and inferior lobes approach each other, by the comparative shortness of the bristles, and the absence of lamellæ. A noteworthy symmetry is also observed on viewing the anterior feet from the lateral aspect. The dark spine occupies the centre of a ring of bristles surrounded by a pale collar. Proceeding from before backward, this ring gradually elongates vertically, and by and by ceases to attract attention. The dorsal division of the foot bears on each side of the spine a slightly raised fold, but no distinct lamella. Another fold occurs at the base of the annulated or barred bristles. A short and slightly tapered cirrus proceeds from the anterior aspect of the origin of the branchia. Depending from the superior lobe is a large, leaf-like lamella, with a midrib formed by the branchia, the tip of which, indeed, emerges from a notch externally. The foliaceous expansion appears to be furnished with channels, and thus the whole arrangement is eminently branchial. The ribbed bristles (Pl. XIVA. fig. 12) are small, and the striæ closely arranged. They are especially narrow when viewed laterally. The long bristles (Pl. XIVA. fig. 13) are proportionally stout, with a distinct curvature at the end of the shaft, and a broad serrated and rapidly tapered tip. The serratures are characteristically bold in comparison with those of *Nephthys dibranchis* and *Nephthys cerrilli*, and, moreover, they occupy only a limited portion of the edge of the broadest part of the blade.

The intestinal canal is filled with greyish mud containing sand-particles, a few Diatoms, Globigerinas, and various Foraminifera.

The noteworthy feature in the structure of the body-wall of this form is the massive condition of the dorsal longitudinal muscles, which constitute apparently a single dense muscle, only slightly narrower in the middle line. The transverse diameter of this

muscular mass is much less than usual. The ventral longitudinal muscles are also thick, being almost ovoid in section. The space between their inner borders is occupied by the large oblique and vertical muscles, which meet in the middle line, over the nerve-area. The latter is somewhat elliptical, wide in the centre, and pointed at each end. Two small neural canals exist on each side of the middle line. The hypoderm forms a distinct layer externally, but the cuticle is thin.

This species approaches the *Nephthys modesta* of Grube from Kerguelen.[1] It appears to differ from the latter in the form of the head, but as Grube gives no minute account of the bristles some degree of doubt remains. They are evidently very closely allied. A large Canadian form, dredged by Mr. Whiteaves in the Gulf of St. Lawrence, presents in a less degree the foliaceous condition of the branchiæ.

Nephthys malmgreni, Théel (?) (Pl. XXVII. fig. 2).

Nephthys malmgreni, Théel, K. Svensk. Vetensk. Akad. Handl., Bd. xvi., No. 3, p. 26 (Sep. Abd.), fig. 17, pls. i. and ii., 1879.

Habitat.—Dredged off Setubal, on the coast of Portugal, at Station II., January 13, 1873; lat. 38° 10′ N., long. 9° 14′ W.; depth, 470 fathoms; surface temperature, 57°·0; sea-bottom, green mud.

A form closely approaching this species was also dredged in the "Knight Errant" at Station 8, August 17, 1880; lat. 60° 3′ N., long. 5° 51′ W., in 540 fathoms.

A fragment of the body of a small *Nephthys* which was formerly procured in the "Porcupine" Expedition. All that need be said of it here is that the foot (Pl. XXVII. fig. 2) consists of two somewhat pointed lobes. The upper bears dorsally an ovoid lamella, and the branchial process, which is large, curves outward in this example, and has a considerable cirrus at its base. The long bristles have the usual curvature and serrations. The annulated or ribbed bristles are distinguished by their great length and the comparatively wide bars. No bristles are present in any of the inferior lobes, which are bluntly pointed. The ventral cirrus is somewhat lanceolate.

Family Phyllodocidæ.

The representatives of this family are few, but of the four, three are new to science, and one is remarkable in the group, in possessing the eyes largely developed, as in the neighbouring members of the Alciopidæ, the size of these organs far surpassing anything hitherto known in the Phyllodocidæ. Ehlers indeed characterises the family as having eyes which are mere pigment-specks without lenses,[2] and De Quatrefages agrees with

[1] *Monatsber. d. k. preuss. Akad. d. Wiss. Berlin*, vom Aug. 1877, p. 535. [2] Die Borstenwürmer, Bd. i. p. 138.

him.[1] The great enlargement of the cephalic ganglion in this form is probably in connection with the development of the eyes.

In his Annulata Œrstediana[2] five species, chiefly South American, are described by Grube, and the same number in the Philippine series.[3] The latter, however, are in all probability littoral forms. No species is mentioned in the Annelids of the "Gazelle." Thirteen are described by Schmarda[4] and nine by Kinberg,[5] but none come from great depths, the majority frequenting shallow water, and a few even being caught at the surface.

The Phyllodocidæ are common between tide marks; and in the present collection none occur under 500 fathoms, that being the depth at which the new type (*Genetyllis oculata*) with the large eyes was dredged.[6]

Phyllodoce, Savigny.

Phyllodoce (*Anaitis?*) *sanctæ vincentis*, n. sp. (Pl. XXVII. fig. 9; Pl. XXXII. fig. 8; Pl. XIVA. figs. 14, 15).

Habitat.—Dredged off St. Vincent, Cape Verde Islands, July 1873.

A small and incomplete form, measuring 32 mm. in length, and at its widest part (about the middle) measuring 2·5 mm. including the bristles.

The dorsum is marked by a little brownish pigment in front, and there are traces of pigment-bars at the junctions of the segments throughout.

The head (Pl. XXVII. fig. 9) is somewhat altered by the extrusion of the proboscis, presenting a bluntly triangular shape, and having two large blackish eyes a little in front of the posterior border. Each is marked by a minute whitish speck, the indication of a "lens." Anteriorly are four short subulate antennæ. The contraction of the region succeeding the head makes it difficult to say whether the tentacular cirri follow the arrangement in *Anaitis* or *Phyllodoce;* that is, whether they arise from three segments (*Anaitis*) or from two (*Phyllodoce*). These processes are of moderate length, and simply tapered.

In the anterior region of the body the superior lamellæ (the homologue of the dorsal cirrus) of the feet are borne on well-marked pedicles, and are large and lanceolate. The setigerous region is moderately produced and bifid. The bristles (Pl. XIVA. fig. 14) have the terminal region of the shaft dilated and spinous. The distal division is rather long, gently tapered, and finely serrated. The spines along the edges of the dilated ends of the shafts are best seen in antero-posterior view (Pl. XIVA. fig. 15). The

[1] Annelés, t. ii. p. 113.
[2] *Vidensk. Meddel. f. d. nat. Foren. i Kjøbenhavn*, 1857–58.
[3] Annel. Fauna d. Philippinen.
[4] Neue wirbell. Thiere, Bd. I. part ii. p. 82 *et seq.*
[5] *Ofversigt k. Vetensk.-Akad. Förhandl.*, Bd. iv. p. 240, 1865.
[6] Prof. Moseley mentions (*Quart. Journ. Micr. Sci.*, vol. xvii., N.S., p. 11, 1877) a bright green *Eteone* from 1127 fathoms, lat. 41° 57′ N., long. 9° 42′, but it was not forwarded with the others for examination.

inferior lamella (the homologue of the ventral cirrus) is convex along its inferior margin, and its tip projects considerably beyond the setigerous region. At the thirtieth foot (Pl. XXXII. fig. 8) the ventral lamella is more acute. At the fiftieth foot the superior lamella is less pointed, the blunt tip being carried downward, and the outward curve along the inferior border being much more decidedly produced. The inferior lamella is more acutely pointed, but it does not project so far beyond the setigerous region as in front. At the ninety-second foot, again, the superior lamella becomes more regularly lanceolate, though broader than in front, and there is also a slight increase in the breadth of the inferior lamella, which, however, remains pointed.

The extruded proboscis shows six rows of papillæ on each side basally, the number in each line being about twelve. The distal region is roughly marked transversely with six rows of warts. The intestinal canal is empty.

The example is distended with ova posteriorly. This species approaches most nearly to the *Phyllodoce* (*Anaitis*) *madeirensis* of Langerhans,[1] but the terminal process of the bristles is decidedly longer.

Phyllodoce duplex, n. sp. (Pl. XXVII. fig. 8; Pl. XXXII. fig. 9; Pl. XVa. fig. 1).

Habitat.—Trawled in 150 fathoms off Twofold Bay, near Station 163, April 4, 1874; lat. 36° 59′ S., long. 150° 20′ E.; surface temperature, 71°·0; sea-bed, green mud.

The specimen is much coiled, but its length appears to be upwards of 40 mm., and its breadth at the widest part (anteriorly) about 3 mm.

It approaches the foregoing (*Phyllodoce sanctæ vincentis*) very closely both in external appearance and in certain structural features. The dorsum has a brownish hue throughout, darker in front, pale posteriorly, the tints being due to bars of pigment (narrow in front, wider posteriorly) at the junctions of the segments.

The head is somewhat broader than in the previous form, and more deeply cordate at the posterior border. The eyes are about the same size (proportionally), and likewise show a trace of a "lens." The other processes are similar. The exserted proboscis has basally, in front of the snout, a single median line of about five papillæ. In the usual position, again, on each side, there are six rows, of about eight or nine papillæ in each. The distal region presents no peculiarity, having six rugæ, with the usual warts at the tip, and a series of papillæ around the aperture.

A general glance over the feet shows that the chief difference between this and the former is the somewhat larger size of the superior lamellæ. The tenth foot resembles

[1] Die Wurmfauna Madeiras, *Zeitschr. f. wiss. Zool.*, Bd. xxxiii. p. 307, Taf. xvii. fig. 44*a*.

that of the former, both having the small hypodermic areolæ in the centre of the superior lamellæ. There is in the present form, however, a greater convexity toward the ventral border, and the base is broader. The inferior lamella is somewhat larger and less pointed. At the thirtieth foot (Pl. XXXII. fig. 9) a more decided divergence occurs, for the superior lamella is larger, more distinctly bevelled at the tip, and projects farther outward from the pedicle, than in the previous species. The ventral lamellæ are more acutely pointed than in the anterior region. There is no striking difference in the fiftieth and sixtieth feet, except the slight increase in the superior lamellæ. At the ninetieth foot, again, the tip of the latter is more acute in the present form, and its outline is different.

The terminal process of the bristles (Pl. XVa. fig. 1) is decidedly longer, and the spines on the tip of the shaft shorter than in *Phyllodoce sanctæ vincentis*. The serrations along the edge of the terminal region are much more distinct.

With the exception of a little fine mud containing a few minute spicula, the intestinal canal harboured only Gregarinæ, which were elongate-ovoid with a tapering tail.

Eulalia, Savigny.

Eulalia capensis, Schmarda, *char. emend.* (Pl. XXVII. fig. 7; Pl. XXXII. fig. 10; Pl. XIVa. figs. 16, 17).

Eulalia capensis, Schmarda, Neue wirbell. Thiere, I. ii. p. 86, pl. xxix. fig. 231.

Habitat.—Procured at Sea Point, near Cape Town, between tide-marks. Schmarda found his specimen under stones in Table Bay.

Length about 45 mm., and breadth, including the bristles, 3·5 mm. The specimen is incomplete posteriorly.

This form is somewhat larger and softer than the ordinary examples of *Eulalia viridis*, O. F. Müller, to which at first sight it bears a close resemblance; yet Schmarda does not contrast it therewith. His description and figures are in need of amendment.

In the preparation the dorsum is brownish-green, and the lamellæ olive-green. The eyes are somewhat larger than in *Eulalia viridis*, and there is externally a little dark pigment close to the base of the first tentacular cirrus on each side, but this has not the well-defined appearance of the outer ocular speck in *Eulalia viridis*, and corresponds to the pigment in the median line of the head posteriorly. The antennæ and tentacular cirri arise in the same manner as in *Eulalia viridis*, only they are shorter, thicker, and softer.

The dorsal lamellæ of the feet are larger than in the common form. Thus at the tenth foot, instead of the elongated triangular outline of that in *Eulalia viridis*, with its

somewhat acute point, in this form there is a broad ovato-lanceolate process which diminishes very slightly till near the tip. The ventral lamella is much more rounded at the extremity than in *Eulalia viridis*, so that its outline forms the greater part of an ovoid. The shape is nearly the same at the thirtieth foot (Pl. XXXII. fig. 10). At the fortieth and fiftieth feet the dorsal lamella is less broadly lanceolate than at the tenth, but it never assumes the acutely lanceolate outline of that in *Eulalia viridis*. The ventral lamella is as distinctly differentiated as in front. From the sixtieth to the ninetieth foot the superior lamella becomes more triangular, from an increase in breadth at the base. The inferior, on the other hand, diminishes in depth (vertical diameter). A slight elongation of the dorsal lobe is again noticed toward the one hundred and tenth foot and the tail, as far as the latter is present. The setigerous lobe of the foot is for the most part in indifferent preservation, so that its outline is ambiguous. The bristles (Pl. XIVA. figs. 16, 17, from the anterior third of the body) seem to have tips of about the same proportional length as in *Eulalia viridis*, and the differences in the curves of the end of the shaft are slight. The shafts, however, are decidedly shorter than in *Eulalia viridis*, and their distal ends more obtuse.

Genetyllis, Malmgren.

Genetyllis (*?*) *oculata*, n. sp. (Pl. XXVIII. fig. 1; Pl. XVA. figs. 2, 3; Pl. XXXIIIA. figs. 1–8).

Habitat.—Dredged at Station 214 (in the Celebes Sea, south of Mindanao), February 10, 1875; lat. 4° 33′ N., long. 127° 6′ E.; depth, 500 fathoms; bottom temperature, 41°·8; sea-bottom, blue mud.

The specimen (which has been slightly dried) measures about 20 mm. in length and 4·5 mm. in breadth at its widest portion.

At first sight the form of the body and the remarkable development of the eyes cause it to resemble an *Alciope*, especially as only a single loose dorsal lamella exists. The dorsum is brownish throughout, the pigment here and there being removed by attrition of the cuticle. Ventrally the colour is pale brown or dull yellowish. The body is somewhat spindle-shaped, tapering more decidedly from the middle toward the head, than posteriorly toward the tail.

The head is small, the greater part of its area being occupied by the two very large eyes, which leave only a small median triangular space in front and another posteriorly. Each eye has a belt of deep brown pigment, best marked dorsally, all round the large transparent cornea, which looks outward and downward as well as forward. Just in front

of the eye are two minute processes, and the snout beneath has a larger cirrus on each side; the latter, however, are imperfect. The segment following the head has dorsally a transverse row of four basal processes (apparently cirri), two larger lateral, and two smaller median. Another is placed on each side a little behind the eye and in front of the outer or lateral just mentioned; and one or two of the anterior feet seem to have had similar dorsal processes. In no case was any appendage present.

As formerly mentioned, all the superior lamellæ are absent, with a single (loose) exception at the anterior part of the dorsum. This dorsal lamella is somewhat heart-shaped, of a dusky brown colour, and has the ordinary structure in the Phyllodocidæ. It arises from a prominent dorsal pedicle, and similar processes occur on the other feet. The latter are conspicuous, the bristles projecting somewhat stiffly outward, so as to form a nearly uniform lateral series. The setigerous region is well-marked, and is very slightly if at all bifid or dimpled at the tip. It is supported by a stout black spine (the same structure in *Genetyllis lutea* being pale), and gives origin to a fan-shaped fascicle of translucent bristles (Pl. XVA. figs. 2, 3, the former representing the tip on edge), the shafts of which have slightly dilated ends, and a shorter terminal appendage than in *Genetyllis lutea*. The serrations on the latter are so fine as to escape ordinary observation.

In transverse section the body-wall seems to differ both from *Eulalia viridis* and *Phyllodoce groenlandica* in type, and it does not approach *Alciope* more closely. Both dorsal and ventral longitudinal muscles are more powerful, and the fasciculi appear to be coarser. The nerve-cords and ganglia are larger than in any of the preceding.

The ventral longitudinal muscles seem to be less extended transversely, having an ovoid form in transverse section.

The structure of the cephalic region and eyes of this form have been, at my request, most carefully examined by Dr. Marcus Gunn, M.A., one of the ophthalmic surgeons of Moorfields Hospital, London, of whose special acquaintance with the minute structure of both vertebrate and invertebrate eyes I have often had occasion to avail myself.

On the Eyes and Cephalic Ganglion.[1]—The eyes of *Genetyllis lutea*, although scarcely to be compared with those of the Alciopidæ, are still well marked objects. They are recognised as two hemispherical projections, situated one on each side of the anterior part of the head, and placed close together. The optic axis of each is directed outwards, forwards, and a little downwards.

Each eye rests, by a very broad base, directly on the cephalic ganglion, while its stout outer coverings are evidently prolongations of the cuticle of the neighbouring part of the head. On making an antero-posterior horizontal section through the eyeball, it is found

[1] Contributed by Dr. Marcus Gunn. See Narr. Chall. Exp., vol. i. p. 629, 1885.

to consist of a central cavity surrounded by two coats. The central space is partially occupied by a faintly granular, transparent substance of firm consistence, probably of the nature of vitreous. The outer of the two coats is the above-mentioned prolongation of the cuticle; the inner covering represents the retina and its central connections.

1. *The Outer Coat.*—At the periphery of the globe, behind or at the outer side, this coat may be seen to be formed of two distinct layers. From without inwards are found:—

(*a*) A thin transparent chitinous layer.
(*b*) A fine connective tissue stroma with distinctly nucleated epithelial-like cells (see Pl. XXXIIIa. fig. 2).

It is doubtful whether or not this layer is again followed by a thin, clear, internal covering; in one section this seems to be the case.[1]

Tracing this outer coat forwards over the eyeball, we find that it becomes very thin, homogeneous, and transparent opposite the middle of the globe. It appears to consist here merely of the chitinous layer somewhat thickened, and lined internally by a delicate endothelium[2] (Pl. XXXIIIa. figs. 1, *b*, and 3). Still more anteriorly this coat again loses its transparent, homogeneous appearance, and in the middle line it meets the corresponding coat of the opposite eye at an acute angle and becomes blended with it, forming here a thick layer with numerous spaces seen on section (Pl. XXXIIIa. figs. 1 and 4, *a*). Some of these spaces, of well-defined elongated oval form, are evidently sections of blood-vessels. This outer coat must be considered as strictly analogous with the corneo-sclerotic of higher animals, the thin, transparent, central part representing the cornea.

2. *The Inner Coat.*—The retina and its central connections.

What first attracts the attention in this situation is a layer of reddish-brown pigment. Tracing it from before backwards, we find it first lining the inner surface of the anterior part of the sclerotic, beginning just outside the corneal margin. It is continued backwards in this relation until it meets with a structure projecting from the fundus well into the interior of the globe, over the anterior or inner surface of which it is reflected. At intervals this pigment is disposed in little heaps, but there is no definite arrangement of the aggregations as we find in the Alciopidæ. It consists of minute round granules, each about 0·5 mm. in diameter.

The mound-like structure just referred to as projecting from the fundus, contains numerous ganglion cells, fine molecular material, and exquisitely delicate fibrils. From its position we should accept it as the nervous part of the retina, but it really represents

[1] Compare R. Greeff, Untersuchungen über die Alciopiden, *Nova Acta Acad. Cæs. Leop.*, Bd. xxxix., No. 2, p. 96.

[2] This endothelium is probably of the same nature as that described by Greeff in this position in the Alciopidæ, and traced by him backwards to the periphery of the cerebral ganglion, with the covering of which it is directly continuous, *op. cit.*, p. 97.

brain, optic nerve, and retina all in one. We shall return to its further consideration presently.

Immediately within the pigment is a clear, firm, faintly granular material, exhibiting no definite structure, and occupying the posterior two-thirds of the eye-cavity. Although corresponding in position within the rod-layer in the Alciopod's eye, yet from its general appearance and absence of structure it is in all probability only vitreous, so that the rod-layer of the retina is quite unrepresented in the eye of *Genetyllis lutea*. In one section only an appearance suggesting the rods was seen, but this may possibly have been due to fine folds (see fig. 6, *a*). In many of the sections the entire pigment-layer with clear substance still adhering to it has become detached from all its other connections (Pl. XXXIIIA. figs. 6 and 8).

In one section there is a deposit of a coarsely granular, coagulated substance resting in the form of little heaps on the inner surface of the vitreous. It has no definite shape, but suggests, from its general appearance and position, a refractive substance of the nature of a lens. Possibly it is semifluid during life.

A horizontal section through the middle of the fundus of both eyes enables us to understand the relations of the nervous matter in this situation. We then observe that there is one large medial ganglion, having a large lateral lobe on each side projecting, as above mentioned, into the fundus of the corresponding eye. The central or medullary portion of the ganglion consists of molecular material and small nucleated cells, while at the periphery or cortex there are large, well-formed ganglion-cells with distinct nuclei and occasionally indications of nucleoli (Pl. XXXIIIA. fig. 1, *e*.). On employing high powers, very delicate fibrils are visible at the junction of the cortical and medullary portions, which seemingly run from one lobe to the other. As will be readily understood from the bilobular shape of the ganglion, it is only from sections through the immediate neighbourhood of its centre that its structure can be duly appreciated. The nearer we approach the periphery in our sections, the more we have the appearance of two distinct ganglia. Thus in a section through the anterior part of both eyes, we have a thick fibrous structure dividing the two lobes, directly continuous with the previously described junction of the sclerotic coats of the two eyes. This ganglion must be regarded as a fused condition of the two cephalic ganglia normally present in this position in the Annelida.

The vessels seen in sections of the sclerotic in the median line are disposed differently in different preparations. In sections nearly through the centre of the globes, we find one or two small oval spaces on each side of the middle line (Pl. XXXIIIA. fig. 1, *a*). If the anterior part be divided, however (Pl. XXXIIIA. fig. 4), we find only one space corresponding to a median vessel cut across. Thus probably the dorsal median vessel splits into two or more lateral branches over the prominence of the inner sides of the eyeballs, to meet again anteriorly and form a ventral median vessel.

Measurements.

Antero-posterior diameter of globe (from cornea to centre of cephalic ganglion) = 0·25 mm.
Transverse diameter of globe = 0·22 mm.
From centre of ganglion to pigment on free surface of ganglion = 0·1 mm.
From pigment on ganglion to anterior surface of vitreous = 0·05 mm.
Thickness of cornea = 0·002 to 0·003 mm.
Thickness of sclerotic in front = 0·02 mm.
Thickness of sclerotic at posterior end of pigment = 0·006 mm.
Thickness of pigment-layer = 0·004 to 0·01 mm.
Diameter (long) of ganglion-cell = 0·012 to 0·02 mm.
Diameter of nucleus of ganglion-cell = 0·006 mm.
Diameter of pigment-granule = 0·5 mm.

Family Alciopidæ.

British zoologists have few opportunities of becoming acquainted with these forms, which, moreover, are so delicate, that unless very great care is taken in collecting, the spirit-preparations are unsatisfactory. Those in the present collection are unfortunately in an imperfect state and much softened.

The genus *Alciopa* was established by Audouin and Milne-Edwards[1] in 1833 for a species (*Alciopa reynaudii*) about an inch and a half long, procured by Reynaud somewhere in the Atlantic during the voyage of the "Chevrette." They supposed that the dorsal and ventral pigment-glands (segmental organs) were branchial in function. Their figure in outline resembles *Greeffia* (*Nauphanta*). Delle Chiaje[2] next (1842) gave three somewhat indefinite figures of two species from the shores of Sicily, viz., *Najades cantrainii* and *Alciopa candida*. Krohn[3] then (1845) described the latter and Milne-Edwards' form, and added a new species (*Alciopa lepidota*), also from Sicily. De Quatrefages,[4] in 1850, gave some interesting observations on *Alciope candida* (which he called *Torrea vitrea*) and its eyes. The same form was subsequently (1862) described by A. G. Costa[5] under the name of *Liocapa vertebralis*, and Delle Chiaje's other species (*Najades cantrainii*), under the title of *Liocapa vitrea*.[6] He further constituted a new genus, *Rhynchonerella*.[7] Hering, in addition to the foregoing, described in his inaugural dissertation three new species from Messina. A young form was discovered by R. Leuckart in one of the Firolidæ at Villafranca in 1855, and Claparède and Panceri probably found the same species in *Cydippe* in the Gulf of Naples.

In the voyage of the frigate "Eugenie" Kinberg[8] describes five new species, viz., *Kronia angelini* (China), *Kronia auroræ* (St. Helena), *Alciopa atlantica* and *Alciopa*

[1] Annél, p. 214, pl. v. figs. 6–11.
[2] Descriz. e notom., &c., Tav. 155, figs. 14, 18, and 21.
[3] *Archiv f. Naturgesch.*, Bd. xi., 1845, p. 141, Taf. vi., and Bd. xiii., 1846, p. 36.
[4] *Ann. d. Sci. Nat.*, sér. 3, t. xiii., 1850, p. 34, pl. ii. figs. 16, 17.
[5] *Annuario del Museo*, &c., i., ii., and iv.
[6] *Op. cit.*, ii. A full bibliography is to be found in R. Greeff's excellent paper.
[7] *Op. cit.*, ii.
[8] *Oversigt o. d. K. D. Vid. Selsk. Forhandl.*, 1861, No. 4, p. 243.

splendida (Atlantic Ocean), and *Alciopa pacifica* (South Sea). Claparède and Panceri, in the Annél. Chétop. du Golfe de Naples (1868), gave an account of *Alciopina parasitica* which they found in *Cydippe densa;* and in his supplemental volume in 1870, the former gave further observations on the group, added two new genera, *Asterope* and *Vanadis*, and used the condition of the snout (cephalic lobe), the presence or absence of an appendix to the setigerous lobe of the foot, and the condition of the proboscis (armed or unarmed), as a basis for classification.

An important paper by R. Greeff[1] in 1876 gives the best account of the group, both historically and anatomically. Like Ehlers he placed them under a special family, the Alciopidæ, distinguished as follows:—Two large and highly organised reddish eyes, and five tentacles. On each side of the foot, ventrally and dorsally, is a brownish segmental organ. Foot has a conical setigerous region, with a dorsal and a ventral cirrus, flattened into lamellæ. The setæ are either simple or compound. Body delicate and translucent. Pelagic.

He makes seven genera, the first five of which do not have the head produced in front of the eyes. Of these *Alciopa* has no appendix to the tip of the foot, and the bristles are simple. *Halodora*, like *Alciopa*, has no armature to the proboscis, nor appendix to the foot, but the bristles are compound. *Asterope* has its proboscis lined with small hard teeth. It has no appendix to the tip of the foot, and the bristles are compound. *Vanadis* has no armature to the proboscis, one cirriform foot-appendix, and the bristles are compound. *Greeffia* (*Nauphanta*[2]) agrees with the latter in all except that there are two cirriform appendices to the foot. The sixth genus *Callizona* has the head raised into a considerable elevation above the eyes. Proboscis without teeth. A cirriform appendix to the tip of the foot. Bristles compound. Lastly, *Rhynchonerella* has also the process beyond the eyes, an unarmed proboscis. No cirriform appendix to the foot. Bristles compound.

Audouin and Milne-Edwards placed the Alciopidæ with the Phyllodocidæ, and the occurrence of large eyes in the remarkable *Genetyllis oculata* just described is of interest in this respect. It is noteworthy that the presence of very large eyes is confined to the Phyllodocidæ, Syllidæ, and Alciopidæ, for the organs of such as *Nectonereis megalops* of Verrill[3] (a *Heteronereis*-form) belong to a different category, though the animal swims at the surface of the sea.

The Alciopidæ occur in most oceans—Atlantic, Pacific, Mediterranean, and the China Sea. They are very rare in the North Sea. They are met with, moreover, both where the surface temperature is low and where it is high, though they appear to be more abundant in the warmer seas.

Very few examples exist in the British Museum.

[1] *Nova Acta Acad. Cæs. Leop.*, Bd. xxix., No. 2, pp. 35–120, Tafn. ii.–vii.
[2] This name is preoccupied, see p. 182.
[3] New England Annelida, pl. v. fig. 1.

Alciopa, Milne-Edwards.

Alciopa antarctica, n. sp. (Pl. XXVIII. figs. 2, 3, 4; Pl. XXXII. fig. 12).

Habitat.—Procured along with *Cleodora* on the surface of the Antarctic Sea, February 21, 1874, between Stations 154 and 155; surface temperature, 32°·0.

A large form, measuring about 73 mm. in length, and at its widest portion stretching about 18 mm. from tip to tip of the bristles.

The body is curiously barred with brown, the intermediate pale portions of the anterior third affording a very bold contrast. The pigment is somewhat irregularly arranged in front, a long dark brown region stretching from the head to the tenth segment, then two narrower brown belts with intervening pale portions occur, these being followed by various lateral patches. Posteriorly a dark belt runs from the foot upward over the dorsum on each side, and is lost for the most part before reaching the median line. On the ventral surface the anterior long dark region is continued from the head backward as on the dorsum, and the two succeeding brownish belts follow a similar arrangement. Pigment-patches proceed from the feet inward, but not so far proportionally as on the dorsum. The body is conspicuously rounded on the dorsum, less so ventrally. It tapers much more anteriorly than posteriorly, but the latter is imperfect. The neck is extremely narrow, so that the head, with the large eyes, is prominent all round. A very narrow portion, again, occurs about the middle of the first or long brown region.

The head recalls that of the dragon-fly, the halves being almost wholly formed by the great eyes. Dorsally these are of the same brownish colour as the rest of the dorsum. Posteriorly a kind of bridge between them causes an elevation in this region. In front of the latter is a hollow, from which a short median tentacle springs. A whitish elevation occurs a little in front, its anterior edge being furnished with three small lobes. On each side of it in front is a short antenna, and another pair spring from its anterior edge. The latter elevation and processes are at the anterior border of the cephalic region. The corneal region of the eyes is invisible from the dorsum. On turning to the ventral surface two well-defined corneæ occur, each occupying the centre of the great brownish ocular area on each side, and separated by a deep fissure in the middle line. Toward its outer border the corneal area shows a dense whitish lens. The corneal surfaces just mentioned are not horizontal, but bevelled, so that they look outward as well as downward. Moreover, the corneæ are close to the ventral border (or tip) in front of the mouth. This buccal frill has a somewhat short and thickish cirrus on each side, opposite the outer border of the cornea. A longer cirrus occurs on each side of the two succeeding segments.

Two remarkable feet follow the foregoing. Each forms a somewhat globular process deeply tinged with brownish pigment, and of a firm consistence. Toward the upper and anterior region is a minute papilla, while inferiorly two processes or papillæ appear on the peduncle.

The bulbous tip of the globular foot is smooth and shining, and somewhat resembles an eye, though structurally there is no evidence to support this view. A tendency to a similar enlargement of the same feet occurs in *Asterope candida*, D. Chiaje. In *Alciopa cantrainii* of the same author four "segmental Drüsen" project externally like warts on each side a little behind the head.

The succeeding foot is a minute one of the ordinary kind bearing bristles, and each gradually increases in size thereafter, becoming long prominent organs about the twelfth foot behind the foregoing globular processes. A fully formed foot (Pl. XXXII. fig. 12) shows a slightly elevated rugose area on the body-wall just behind its base. The free portion consists of three divisions, viz., the superior lamella, the setigerous region, and the inferior lamella. The first has the shape of an ovato-lanceolate leaf, with a depression on its anterior surface corresponding to the midrib. It is supported on a short peduncle, the base of the lamella being slightly though evenly cordate. It is composed internally of hypodermic tissue, the cells or areolæ of which radiate outward in a fan-shaped manner. The next or setigerous region is elongated and acutely pointed, the tip ending in a short filiform cirrus above the spine, which projects far outward. It supports the very much elongated translucent tuft of simple tapering bristles, which generally show a slight curvature toward the tip. These bristles do not appear to present anything characteristic in structure, except that there is no indication of a central cavity. They are not very brittle. None of the extremely attenuate tips are complete. The inferior lamella is also ovato-lanceolate, but a considerable portion of its base (the edge of attachment) is cut out, so that the upper margin is incomplete. It is nearly as large as the superior lamella.

It is remarkable to find a pelagic form with its eyes placed inferiorly, yet this arrangement is not uncommon in the Alciopidæ, for several species of *Alciopa*, *Vanadis*,[1] and others present this feature, though in a somewhat less marked degree than the present species.

Unfortunately the condition of the preparation prevents a minute examination of the structure of the body-wall, which, however, in general arrangement seems to conform to the type originally given.[2]

Alciopa (*?*) *quadrioculata*, n. sp. (Pl. XXVIII. fig. 8 ; Pl. XXIX. fig. 7).

Habitat.—From the surface of the sea at Honolulu, July 1875 ; the surface temperature was about 76°·0.

[1] *Vide* R. Greeff, *op. cit.*

[2] *Proc. Roy. Soc. Edin.*, 1876–77, p. 373.

The specimen is very much injured, so that it is not possible to give a satisfactory description.

The general aspect somewhat resembles that of *Greeffia* (*Nauphanta*). It is marked with brownish bars dorsally, and has the dark brownish "segmental" glands behind each foot anteriorly. The head is distinguished from that of its congeners by the presence of four eyes, two of which, however, are rudimentary. Dorsally (Pl. XXVIII. fig. 8) two enormous eyes occupy almost the entire surface of the head, the cornea of each being directed outward, and the lens appearing in the centre laterally. The dorsal curves of the eyes seem to have been occupied by reddish-brown pigment, deepest at the margin of the corneæ. Inferiorly each cornea adjoins an ovoid pale area, the long axis of which is directed forward and inward. This pale surface is much softer than the cornea and lens above it (that is, of the upper eye), and is surrounded by a ring of reddish-brown pigment, very well marked inferiorly. It is an accessory eye, looking outward and forward, with a slight tendency downward.

The snout is terminated by a crenated central margin, which hardly projects beyond the anterior curve of the eyes. This bears four tentacles, two at the outer margin dorsally, and two at some distance on the ventral surface. The interval between the dorsal and ventral pairs is larger than any yet observed, and is interesting as bringing the ventral pair nearer the ventral eyes. Between the great dorsal eyes a small papilla lies in the central streak. This is probably a rudimentary tentacle. The proboscis has the usual pair of filiform processes, and no hard parts occur in its interior.

The condition of the feet precludes further remark than that the setigerous region seems to be pointed. No bristles are present.

As indicated, the body is very soft, but in the section a somewhat thick cuticle occurs externally in the ventral median line, followed by a thin layer of hypoderm, which increases in thickness at the nerve-area. The circular muscular coat is indistinct, the only fibres observed being those crossing the nerve-area. The oblique muscles pass downward over the inner surface of the ventral longitudinal series, and appear to become connate below the nerve-cords, some fibres, however, apparently passing above the latter, and thus surrounding them. The size of the nerve-cords is moderate, and their shape ovoid.

Alciopa (?) (Pl. XXXII. fig. 13).

Habitat.—Two fragments, without heads, were procured on the surface of the sea, off Honolulu, Sandwich Islands, July 1875; surface temperature about 76°·0.

The colour of both is pale or slightly brownish at some points, and with a dark brown "segmental" gland behind each foot. The latter (Pl. XXXII. fig. 13) has a somewhat

acutely lanceolate superior lamella, and a similar ventral lamella. The setigerous lobe is pointed, with a long spine projecting considerably beyond the tip, and a tuft of long translucent, tapering bristles. There is nothing further to aid in diagnosis.

Halodora, Greeff.

Halodora reynaudii, Aud. and Ed. (?) (Pl. XXXIIIA. figs. 1, 10–12, 14–18, 20–22 ; Pl. XXXIVA. figs. 1, 3–6).

Habitat.—Caught on the surface of the sea, near Station 3 (south of the Canaries), February 18, 1873 ; lat. 25° 45′ N., long. 20° 14′ W. ; surface temperature, 65°·0.

The specimens of this species are so imperfect that no reliable description is attainable. The soft parts of the feet and cirri, as well as the bristles, are absent. The body is barred with reddish-brown, and is not much tapered in front. The eyes are large, and the corneæ external. The absence of the hard processes in the proboscis points it out as different from *Asterope*, though there are two long cirriform appendages to the organ in front. The dense wall of the proboscis is formed of a closely arranged series of circular and radiating fibres, while the hypodermic lining is raised into prominent and somewhat thick folds. The inner surface shows so little of the cuticular element that it resembles the section of a lining that during life has been coated with cilia.

The nerve-area is placed somewhat higher than usual, being situated above the level of the inner borders of the ventral longitudinal muscles. The thick, circular, muscular coat passes to its exterior, and the oblique muscles likewise pass below it in the anterior region of the body, the only one in a condition for examination. The nerve-cords are comparatively large.

The eyes of this specimen have been studied minutely by Dr. Marcus Gunn, whose Report thereon is as follows :—

Eye.—In general form, in the arrangement of its parts, and in the structure of its outer coats, the eye of this species conforms with the description given by Greeff of the eyes of the Alciopidæ examined by him.

Lens.—The lens is globular as in the other members of the group, and its large size renders it easily visible to the naked eye. Its diameter is 0·32 mm. On section (antero-posterior) it is seen to consist of a granular, softer, cortical part surrounding a clear, highly refracting, dense central part. The cortex extends inwards for about one-eighth of the entire radius. The clear dense part immediately within the cortex is interrupted about midway between centre and periphery by a series of crescentic spaces arranged in concentric rows. The specimen figured exhibits a very finely granular material in the position of the centre of the nucleus (Pl. XXXIIIA. fig. 22).

Retina.—The rods are frequently granular on their surface, and their general form is very irregular from faulty preservation, but in other respects the retina is in fairly good condition. The *rods* are of two distinct kinds, as described by Greeff,—the *cylindrical* and the *club-shaped*. Each rod consists of a clear cortex or shell and finely granular contents. The cortex is probably chitinous in nature, as Greeff has shown. The transverse striation which he has described in the inner part of the cortex I only find in the cylindrical rods (Pl. XXXIVa. figs. 6), and the appearance seems to be quite an artificial one, due to a dotted coagulation on its inner surface. There is never any appearance of cleavage into disks, as occurs in the transversely striated outer segments of the rods of vertebrates. The contents of the rod consist of a clear substance containing fine granules, considered by Greeff to be protoplasm. He also describes in this substance a central axial fibre, which he thinks is connected with the inner end of the nucleus of the columnar cell-layer, and pigment-granules derived from the pigment-layer of the retina. In none of the specimens I have examined has this pigment been prolonged more than a very short distance from the outer ends of the rods, and I have never satisfied myself of its presence inside the rod, but think rather that it simply adheres to its outer surface. I shall have to refer to this subject later on when I consider the pigment-layer. I have been unable to satisfy myself of the existence of a central axial fibre. The contents of the rod seem to me to be of a vitreous nature, since it behaves in the same way towards staining fluids, and is of a similar refractive power. If this substance were really protoplasmic it ought to stain deeply with logwood, but this reagent has very little effect upon it.

The cylindrical rods are very long and thin, measuring 0·07 mm., and are situated at the centre of the fundus. The club-shaped rods vary much in breadth, probably from the manner of preservation. They do not generally show the half-ring appearance on cross-section as described by Greeff. On the contrary, I believe them to be formed by the sides of a ridge-like elevation being folded inwards so as to meet at their edges and enclose a space which becomes filled by a prolongation from the vitreous (Pl. XXXIVa. fig. 5). I only once observed the half-ring appearance, and this seemed to occur quite near the outer end of the rods only, judging by the size of the cross-sections.

At the extreme periphery, and also immediately anterior to the part of the retina possessing rods, these latter structures are represented by a thin clear layer lining the inner surface of the pigment (Pl. XXXIIIa. figs. 16, 18). Near, but not quite at, the periphery, again, the rod-layer consists of highly refracting tapering processes connected with the inner surfaces of round dark aggregations of pigment (Pl. XXXIIIa. fig. 17).

Just outside the rods we find the *pigment-layer* of the retina. Its appearance varies according to the part of the fundus which is examined. Posteriorly it forms a tolerably uniform layer about 0·01 mm. thick, of a light reddish-brown (burnt-sienna) colour, with numerous vertically elongated deposits of darker pigment-granules. Each of these

deposits corresponds with the point of insertion of a rod. They are disposed with much regularity, and at distances varying with the greatest breadth of the corresponding rods; thus, where the rods are narrow and cylindrical, the pigmentary deposits are placed close together, while they are much more widely separated where the rods are broad and club-shaped. As mentioned above, I have never found these pigment-granules definitely within a rod (as described by Greeff) nor removed far within the inner surface of this layer. I believe that the pigment is placed entirely outside the rod, and that it probably travels farther inwards during exposure to a bright light, behaving similarly in this respect to the granules in the pigment-layer of the vertebrate retina (Kühne). In this way may be explained how Greeff has found pigment quite near the end of the rod. His specimens were frequently examined fresh, consequently just after exposure. The Challenger specimens were probably collected along with a good deal of other material, and soon transferred to the preserving fluid, instead of being kept alive and examined in a good light.

Instead of being uniform in thickness, the pigment is in some places arranged in the form of large hemispherical bodies, the flat surface of each being turned inwards, and corresponding with the insertion of three or more rods. A collection of dark granules is found at the insertion of each rod here as elsewhere, but between this and the outer rounded surface of the hemispherical body there is a line showing much less pigment than elsewhere. This lighter area evidently is due to the presence here of the outer end of the rod or a prolongation inwards of the columnar layer (Pl. XXXIIIA. fig. 10). This can be seen distinctly in a transverse section (Pl. XXXIIIA. fig. 15; Pl. XXXIVA. fig. 4), where we get a small, round, clear spot in the same situation.

Near the periphery of the retina, and connected with the tapering rods above mentioned, the pigment-layer consists of large globular masses each formed by a collection of very dark granules. The granules are oval in shape and of considerable size, measuring one micromillimetre in length and half a micromillimetre in breadth (Pl. XXXIIIA. figs. 11, 16, 17, 18). On each side of this part of the retina, reaching the extreme periphery anteriorly, and becoming continuous with the layer connected with the club-shaped rods posteriorly, the pigment is of a uniform reddish-brown colour, without dark aggregations of any kind (Pl. XXXIIIA. figs. 16, 18).

I believe that this layer is of the nature of a cellular membrane, containing nuclei at intervals, but not necessarily one for every dark pigment-aggregation by any means. In support of this belief I would direct attention to Pl. XXXIIIA. figs. 10, 12, 14, 15, 16, 18, 20, 21, and Pl. XXXIVA. figs. 1, 4, 6. In nearly all these figures we have an indication of such a structural condition, but the division of the pigment into cell-areas is particularly observable in Pl. XXXIIIA. figs. 12, 14, 15, 16, 18, 21, and Pl. XXXIVA. fig. 6. In Pl. XXXIIIA. figs. 12 and 16 the divisions are small, one apparently corresponding with the insertion of nearly every rod; while in figs. 14, 15, and 21 there

are several rods inserted into the same cell-area. In figs. 14 and 21, moreover, we find large light spots in the pigment, neither in size nor position suggesting sections of the rods, which in both cases are narrow. Here I believe we really have nuclei, and in fig. 18 one or two of the nuclei figured also appear to belong to the pigment-layer. In Pl. XXXIVa. fig. 1 we have a most remarkable appearance, part of this layer being practically devoid of pigment.[1] In this colourless spot we find a small nucleus, which would doubtless have escaped observation in the normal pigmented condition.

Immediately outside the pigment we have a layer of nucleated columnar cells, varying in length according to their situation, becoming shorter towards the periphery of the retina. The inner end of each is, as it were, crowned by a deposit of the pigment-layer, while the outer end tapers off and is continued as a nerve-fibre. I have never seen proof of a direct connection between this cell and the outer end of a rod. If such a junction exist, as is supposed by Greeff, it is concealed by the position of the pigment deposit. The large globular masses of pigment near the periphery of the retina have well-marked columnar cells connected with each (Pl. XXXIIIa. figs. 11, 16, 17, 18), but these do not appear to have any connection with the layer of nerve-fibres. Where there are no darker aggregations in the pigment-layer, as described above (figs. 16, 18), we find nuclei but no columnar cells. At intervals among the columnar cells we find clear, highly refracting tapering bodies, each resting by its base on the pigment-layer. Their fine terminal processes can be traced quite half-way through the columnar layer. I consider them to be of the nature of a supporting connective-tissue like the Müllerian fibres of the vertebrate retina (Pl. XXXIIIa. fig. 16; Pl. XXXIVa. figs. 1, 3, 4). They are possibly processes (?) of the cellular membrane forming the pigment-layer.

Measurements.

Diameter of lens,	0·32 mm.
Length of rods,	0·028 to 0·07 mm.
Breadth of rods,	0·004 to 0·012 mm.
Thickness of cortex of rods,	0·0008 to 0·0012 mm.
Average thickness of pigment-layer at insertion of rods,	(about) 0·008 mm.
Pigment-aggregations of rods,	0·0045 mm.
Thickness of peripheral pigment-layer,	0·02 mm.
Diameter of large peripheral pigment-balls,	0·012 mm.
Ultimate pigment-granules forming latter,	0·001 × 0·0005 mm.
Length of columnar cells of retina proper,	0·06 to 0·1 mm.
Length of columnar cells near periphery,	(about) 0·06 mm.

[1] Several sections passing through this non-pigmented area were cut consecutively and lie in proximity on the same slide. Of all the sections of the retina of species of *Alciopa* that I have made and examined, this is the solitary example of such a condition, and I am inclined to think that we have really here to deal with a congenital abnormality, occurring in this individual.

Greeffia (*Nauphanta*[1]), Greeff.

Greeffia oahuensis, n. sp. (Pl. XXVIII. figs. 5, 6, 7; Pl. XXXII. fig. 11; Pl. XVa. fig. 4).

Habitat.—From the surface of the sea, off Honolulu, Sandwich Islands, July 1875; surface temperature about 76°·0.

The example is broken, but seems to reach about 33 mm. in length and 6·5 mm. in breadth.

The body is slightly tapered toward the front, and furnished laterally with a series of conspicuous and massive lamellæ, which somewhat resemble those in *Notophyllum*. The dorsum is pale brownish, marked along each side by the dark olive-brown glands at the bases of the feet, and a smaller ("segmental") gland of the same kind occurs at the posterior border of the foot ventrally. The body tapers considerably towards the tail, which, however, is incomplete. The head (Pl. XXVIII. fig. 5) is wider than the neck, and has two very large pale brown lateral eyes with the corneæ directed outward. A bridge of tissue occurs between the eyes at the posterior border of the head; and from the groove or hollow in front of it arises a short flattened tentacle of a somewhat ovate form. A well-marked isthmus exists between the eyes in front, and forms an anterior promontory with a somewhat crenated edge. This promontory bears four antennæ, two at the external angles and two a little within and slightly below the former. The eye has a large cornea, which at its margin presents a sheen like the tapetum, of a brownish-red hue. The lens appears to be median. The prominent lateral position of the eyes probably gives very extensive vision—forward, outward, and backward. Ventrally (fig. 7) the two long proboscidian tentacles project conspicuously from the mouth. Close behind the eye inferiorly is a short subulate cirrus, probably attached to the buccal segment, and immediately succeeding is another pair of similar organs on each side. Greeff describes four pairs in his *Nauphanta celox*.

The segment following the foregoing bears an upper larger and smaller inferior lamella, both ovato-lanceolate, and a speck of pigment at the base posteriorly, but no setigerous region. The next segment shows a great increase in the lamellæ, the superior being broadly cordate. A small papilla near the upper border of the inferior lamella indicates the setigerous division, and an elevated brownish papilla indicates the superior "segmental" gland. At the eighth foot (from the first lamelligerous somite) the first trace of the inferior "segmental" gland occurs as a minute pigment-speck a short distance below the dorsal one. The setigerous lobe now bears bristles. The dorsal

[1] Prof. Haeckel has employed this generic name (*Nauphanta*) for one of the deep-sea Medusæ procured in the same Expedition, Monographie der Medusen, Th. ii. p. 87, 1879 and 1881; System der Medusen, No. 452, p. 487, 1879; and Zool. Chall. Exp., part xii. p. 103, 1881. The same term had formerly been used by Kinberg in 1864 for a genus of the Eunicidæ, while Greeff applied it in the present group.

brown gland still lies behind the peduncle of the foot. At the tenth foot both dorsal and ventral glands are much enlarged, the former soon becoming as elevated as the lamella. It continues prominent all along the dorsum, forming posteriorly a thick lamelliform mass, projecting upward and forward at the inner edge of the superior lamella, and rendered very conspicuous by its brownish-olive pigment. The superior lamella (Pl. XXXII. fig. 11) becomes somewhat crescentic in outline, and its surface is variously frilled in the preparation. It appears larger than it really is on the body of the Annelid, since its peduncle is both broad and prominent. The setigerous region of the foot forms a short cone, which does not project so far outward as the margins of the lamellæ, and its spine is also less prominent than in *Alciopa*. On each side of the latter (above and below) is a short cirrus. The inferior lamella also forms in its fully developed condition an irregularly crescentic plate, variously frilled. It is somewhat less than the dorsal. At its inferior and inner margin is a prominent lobate appendage attached to the base of the foot in front of the dark brown "segmental" gland.

The bristles (Pl. XVa. fig. 4) project from the foot in the shape of a broad fan, and are straight and extremely translucent. They taper to slender tips, which have a terminal process attached to one side, a small portion of the tip of the shaft being visible beyond the point of junction.

In transverse section the circular muscular layer is feebly developed outside the ventral longitudinal muscles, indeed, only a few fibres cross the outer region of the nerve-area. The latter lies in the superior angle of the decussating oblique muscles, which spread out beneath it. The cords are comparatively large and rounded. The hypodermic glandular tissue attains great development in the lateral appendages of the body. The wall of the alimentary canal is also furnished with a thick glandular lining. Male reproductive elements are present in the specimen.

The tentacle and antennæ of Greeff's *Nauphanta celox* differ from the foregoing, but otherwise there is a close resemblance.

A similar form, in a softened condition, exists in the British Museum, from the South Pacific, collected in the tow-net by Commander Knocker, R.N. (68, 6, 29, 6). It is in the same bottle with *Alciopa* (*Halodora*) *reynaudii*, Aud. and Ed.

Family Hesionidæ.

The number (five) representing the Hesionidæ is comparatively small, though only one less than Semper's Philippine forms, and it is to be remembered that the group is more generally abundant in shallow than in deep water. The occurrence of a new genus, *Dalhousia*, from the deep water off the Canaries, somewhat allied to Claparède's genus *Tyrrhena* from the Bay of Naples, and of the intermediate type *Salvatoria* from Kerguelen, is especially noteworthy. Grube gives three in his Annulata Œrstediana,

but only one (*Lamproderma longicirra*) from New Britain in the collection of the "Gazelle." Schmarda, again, mentions a single *Hesione* and six species of *Cirrosyllis*, but the position of some of the latter, as Ehlers truly says, is doubtful. Two species of the group are recorded by Kinberg in his voyage, and Marenzeller describes one from Southern Japan.

Many new genera have, within comparatively recent years, been added to the group by Claparède, Grube, De Quatrefages, Marion and Bobretzky, and Ehlers.

Hesione, Savigny.

Hesione pacifica, n. sp. (Pl. XXIX. fig. 2; Pl. XXXII. fig. 14).

Habitat.—Dredged at Station 172, July 22, 1874 (off Nukalofa, Tongatabu); lat. 20° 58′ S., long. 175° 9′ W.; depth, 18 fathoms; surface temperature, 75°·0; sea-bottom, coral mud.

A species about 23 mm. in length, and (with feet) nearly 4 mm. in breadth at its widest region.

The body is somewhat fusiform in outline, and the cuticle is iridescent throughout. The dorsal surface is convex, while the ventral is grooved by a longitudinal furrow.

The head is bluntly conical in shape, broader posteriorly than in front. Anteriorly are two short and somewhat slender tentacles, arising from the front of each lobe, and at some distance from each other. Two eyes are situated in the line of a V on each side, the anterior being slightly larger. On the buccal segment a single cirrus occurs on each side. Grouped behind this are three pairs of attenuated cirri, the dorsal considerably longer than the ventral, and all being filiform and tapering. The proboscis is only partly protruded, but shows no processes. It appears to be quite smooth on section.

The first bristled foot bears a long dorsal cirrus (filiform and tapering like those in front), a thick setigerous process, and a somewhat long ventral cirrus. The foot (Pl. XXXII. fig. 14) springs from a curious prominence (slightly marked in this case) which projects laterally in each segment. This projection forms a kind of raised cushion with characteristic vertical wrinkles, and extends from the anterior to the posterior margin of each segment. The number of segments bearing bristles is sixteen. Unfortunately not a single complete bristle could be found. All had been broken and the tips lost. The spine, as usual in the genus, is black. The dorsal cirrus springs from a conspicuous basal segment, above which the organ appears to be only crenulated, till near the tip, where it is distinctly segmented. It may be segmented throughout in life. The ventral cirrus is slightly enlarged at the base, which springs directly from the ventral edge of the foot.

The anus projects on a cylindrical pillar posteriorly, and has two cirri on each side.

This form approaches the *Hesione intertexta* of Grube,[1] from Samboangan, but differs in the structure of the head, and the arrangement and size of the eyes. It also comes near *Hesione splendida* of Savigny,[2] though the body is more elongate, and the shape of the head different.

Hesione (*Fallacia*) *pantherina*, Risso (Pl. XXIX. fig. 1; Pl. XXXII. fig. 16; Pl. XVa. fig. 10).

Habitat.—Dredged off St. Vincent, Cape Verde Islands, July 1873.

A form measuring about 23 mm. in length and 5 mm. (including the bristles) across its widest part.

The head (Pl. XXIX. fig. 1) is somewhat triangular, broad behind, and tapering to a blunt point in front. The anterior end is grooved, so that the tip seems to be composed of two connate tentacles. The eyes are much larger than in the previous species, and the axes of the pairs on each side less oblique. As usual, the anterior pair are the larger, and their outline is circular. The posterior pair are somewhat ovoid, the long axis being directed forward and inward. The buccal segment bears three sets of processes. The first is a solitary cirrus; then, dorsally, are two cirri of considerable size, beneath which are two double processes, the lower in each, corresponding to the ventral cirrus. The specimen, however, is incomplete. Just behind a line continued from the nuchal fold on each side is the first foot, consisting of a dorsal cirrus, a stout bristle-bearing process, and a ventral cirrus.

There are sixteen bristle-bearing feet, which, for the most part, retain the characters just mentioned. Dorsally (Pl. XXXII. fig. 16) the long cirrus has a basal segment, and the process itself is curiously annulose. The setigerous process is stout and the tip very blunt. It is supported by two spines with brownish-black tips. The bristles (Pl. XVa. fig. 10) are pale and translucent, and their shafts show only very faint traces of transverse bars. The shaft is enlarged at the tip beneath the terminal appendage. The latter is comparatively short, and has two terminal hooks and a third process beneath, just as shown by Marion and Bobretzky in *Fallacia sicula*[3] from the Gulf of Marseilles.

So far as could be observed there is no papilla in the proboscis, which presents a well-marked pale raphe dorsally and ventrally.

Externally the body has the usual iridescent aspect, and the lateral cushions above the feet are very prominent. The anus is terminal, and has two cirri on each side.

The specimen appears to resemble Risso's species, though the form of the head somewhat diverges. The bristles correspond with those of an example of the former in

[1] Annel. Fauna d. Philippinen, p. 102, Taf. vi. fig. 5.
[2] Syst. des Annél., p. 40, pl. iii. fig. 3.
[3] *Ann. d. Sci. Nat.*, ser. 6, t. ii. p. 47, pl. xii. fig. 28.

the British Museum,[1] but the preparation otherwise is not in a condition for minute scrutiny.

Hesione (?) (Pl. XXXII. fig. 15; Pl. XVA. figs. 8, 9).

Habitat.—Dredged in shallow water off St. Thomas, West Indies.

A fragment of the posterior end of a *Hesione*-like form, consisting of a considerable number of segments of uniramous feet. The dorsum is rounded and the ventral surface grooved. The body-cavity is filled with a vast number of granular cells, probably ova, which also occur in masses in the feet.

Each foot (Pl. XXXII. fig. 15) has dorsally a long filiform, slightly jointed cirrus attached to a basal segment, a pointed setigerous region beneath, with the bristles divided into two groups by the papilla of the spine. The ventral cirrus is short and tapered. The bristles above the spine have more slender shafts and more elongated tips. The distal end of the shaft is devoid of transverse markings, but it has a peculiar longitudinal wrinkle just below the tip, and this is present in all the bristles, both superior and inferior. The latter bristles are somewhat stouter, and the tips shorter (the usual gradation occurring from above downward, as indicated in Pl. XVA. figs. 8, 9—the former representing an inferior bristle, the latter a superior). The extremity has a terminal hook with a long spur beneath. The transverse markings are very well shown in the shafts below the regions figured. The anus is terminal.

In transverse section, the nerve-cords lie beneath the insertions of the oblique and vertical muscles, which form a continuous arch. The hypoderm and cuticle occur externally.

Dalhousia,[2] n. gen.

Body moderately elongated, head somewhat resembling that in *Tyrrhena*, viz., with a subfrontal tubercle, but devoid of the median tentacle. Maxillæ absent in the preparation. Tentacular cirri eight. Foot with simple slender setæ dorsally, and bifid bristles ventrally.

Dalhousia atlantica, n. sp. (Pl. XXIX. fig. 3; Pl. XXXIII. fig. 2; Pl. XVA. figs. 5, 6, 7).

Habitat.—Dredged at Station 3 (south of the Canaries), February 18, 1873; lat. 25° 45′ N., long. 20° 14′ W.; depth, 1525 fathoms; bottom temperature 37°, surface temperature 65°; hard ground.

[1] Spinola, N. S., 22nd February 1821.

[2] Named after the Earl of Dalhousie, K.T., who has both earnestly and practically interested himself in the marine fisheries of this country.

Length about 16 mm., and breadth, from tip to tip of the long feet and bristles, from 7 to 8 mm.

The body appears to be clavate, the anterior end being large, and the posterior tapered to the anus, which is situated dorsally. The upper surface is rounded, the ventral marked by the usual longitudinal groove. It does not appear that the peculiar tapering posteriorly is due to reproduction of the tail.

The head (Pl. XXIX. fig. 3) projects forward from an overlapping collar formed by the first segment, and is mapped out and mottled in a peculiar way. Thus the central region is curved forward in front, and speckled with dark pigment anteriorly, while the lateral region on each side is formed by an elevated area, sloping from behind forward and outward like the arms of a V. A crescentic band of dark pigment is situated at the posterior border of each of the latter, in front of which comes a pale belt followed by the tinted region on which the eyes are situated. The anterior eyes are considerably larger than the posterior. Both have reddish-brown pigment in the preparation. In front of the eyes the ridges subside into the general level of the snout. Two tentacles occur on each side, a larger external with a distinct segment at the tip, and a smaller internal filiform one without such differentiation.

The buccal region bears dorsally three cylindrical processes, the third on each side being bent up as if for the support of a scale. All these, however, are probably the basal processes of cirri, and they increase in size from the first to the third. Inferiorly are also three basal processes for cirri, but these are not symmetrical with the others, the last being in a space behind the third dorsal process. The second and third possess a ventral cirrus. Behind the latter comes the first bristled foot, which bears a dorsal cirrus nearly as large as those in front, a slender setigerous process, and a delicate ventral cirrus. The next foot shows a trace of a superior division as well as a dorsal cirrus (Pl. XXXIII. fig. 2, anterior foot before the normal shape of the dorsal division is attained), and, by and by, the foot is completely formed. In the fully developed condition a slender elongated dorsal cirrus is attached to a basal segment, while two delicate blackish spines support a group of elongated, tapering, simple bristles (Pl. XVa. fig. 5), which, except at the curved and slender tip, are marked by a close series of transverse striæ. The inferior division of the foot is largely developed, and has a conspicuous, fan-shaped fascicle of pale straw-coloured, stoutish, slightly curved bristles, with characteristic terminal pieces. When viewed laterally the shafts present a considerable increase in size toward the tip, and are marked by longitudinal, or obliquely longitudinal lines, and fine transverse striæ. The terminal appendages decrease in length from the superior to the inferior border of the foot. Each is articulated, as in the Nereidæ, by a somewhat pointed end, to a socket at one side of the tip of the shaft, and has the shape of a broad and slightly curved sword-blade, wide at the base and narrow toward the tip. The latter is bifid, with a terminal hook, a stout knob beneath, and a slender elongated spur or process projecting

a short distance below. In the superior bristles, however, the latter extends beyond the lower hook or knob (Pl. XVA. figs. 6, 7, the former representing one of the longer superior, the latter one of the shorter forms). The ventral cirrus is slender and filiform, and shows no basal segment.

There is a prominent central longitudinal ridge below the snout, just above the opening of the mouth. It ends in a thin edge posteriorly, and joins the internal buccal folds. The interior of the proboscis is smooth, and shows traces of dark pigment on the surface. The alimentary canal is empty.

This form seems to diverge from any hitherto described, both generically and specifically. It pertains to that group of the Hesionidæ[1] of Claparède in which the foot is biramous, the upper branch having simple hair-like bristles; but it differs from the known genera *Leocrates*, Kinberg,[2] *Tyrrhena*, Claparède,[3] and *Lamproderma*, Grube,[4] in having no median tentacle, and in other particulars. So far as could be observed in the preparation, no dental armature occurred in the proboscis, but as the specimen is in an indifferent condition, too much reliance need not be placed on this point. The structure of the tips of the ventral bristles is diagnostic.

Salvatoria,[5] n. gen.

Body somewhat elongated. The four eyes almost in a transverse line. A single median and a lateral tentacle on each side. One pair of tentacular cirri. All these organs have enlarged bases and articulated tips. The biramous foot has the dorsal division represented by a single simple bristle. In the ventral branch the terminal pieces of the bristles are sabre-shaped with simple hooked tips.

Salvatoria kerguelensis, n. sp. (Pl. XXX. fig. 4; Pl. XXXIII. fig. 1; Pl. XVA. figs. 11, 12).

Habitat.—Dredged at Station 149K (off Christmas Harbour, Kerguelen), January 29, 1874; depth, from 45 to 120 fathoms; sea-bottom, volcanic mud. It was picked out from the debris of *Lætmonice* (in spirit).

A minute species about 4 mm. long and about half a mm. broad.

The body is slightly tapered anteriorly (Pl. XXX. fig. 4), and considerably more so toward the tail. The head is bluntly triangular, and furnished with four conspicuous brownish eyes, which are arranged near each other toward the posterior part of the head,

[1] Annél. Chétop., p. 228.
[2] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1865, No. 4, p. 244.
[3] Annél. Chétop., p. 227, pl. xviii. fig. 3.
[4] *Monatsber. d. k. preuss. Akad. d. Wiss. Berlin*, 1877, p. 52.
[5] Named after the College of St. Salvator, St. Andrews.

and little removed from a transverse line. The outer pair, however, are somewhat anterior as well as very much larger than the inner; and while the latter are round, the former are ovoid. The anterior border of the snout is slightly notched, and just behind the latter is a slender median tentacle. On each side is another tentacle having an enlarged base and a segmented tapering tip. The next organs consist of two tentacular cirri, the dorsal being similar in shape to the pair in front, only somewhat larger and longer, the ventral shorter and more slender. The posterior situation of the eyes, the notch of the snout anteriorly, and its linear continuation backward, would seem to indicate some relationship to the soldered lobes of *Sphærosyllis*. Moreover, the aspect of the pharyngeal region and of the proventriculus is Syllidian, though the latter organ appears to be transversely ridged rather than papillose.

The foot behind the tentacular cirri is setigerous. Dorsally each foot (Pl. XXXIII. fig. 1) bears a cirrus of moderate length, slightly narrowed at the base, then widening and finally tapering to a filiform tip. The state of the preparation is indifferent, but anteriorly the distal region of each cirrus is distinctly segmented. The setigerous region is obliquely conical. The chief spine occupies the usual position in the Syllidæ. Above the spine is a single simple bristle (Pl. XVa. fig. 11) with a slightly bent tip which is acutely tapered. The bristles beneath (Pl. XVa. fig. 12, one of the superior) have elongated sabre-shaped terminal pieces, the point being simply hooked. The ventral cirrus is a simple subulate process which reaches somewhat beyond the tip of the setigerous region.

This form approaches that group of the Hesionidæ in which *Gyptis*[1] and *Ophiodromus*[2] are placed, the biramous foot showing superiorly a very rudimentary branch. In *Salvatoria kerguelensis* the latter has only a single simple bristle. The body somewhat resembles that of the Syllidæ in length.

Family Syllidæ.

The Syllidæ of the Expedition are not very numerous, being only eleven in number, but one of the most remarkable animals procured by the Challenger occurs in the group, viz., *Syllis ramosa*, a form which throws off lateral buds so readily as almost to form a meshwork of living tissue, these buds being branches of the parent-stock, and having their alimentary canals connected with that of the original portion. Moreover, sexual buds are also produced at various points in the same manner.

Prof. Grube describes fifteen species from the Philippines, ranged under four genera, viz., *Syllis*, *Odontosyllis*, *Autolytus*, and *Platysyllis*, whereas the eleven Challenger

[1] Marion et Bobretzky, *Ann. d. Sci. Nat.*, ser. 6, t. ii. p. 50.
[2] Sars, *Oversigt o. d. K. D. Vid. Selsk. Forhandl.*, 1861, pp. 87, 88.

species range themselves under five genera. One of the most interesting discoveries in Prof. Grube's series is the occurrence of very large eyes, with lenses in the ventral pair, in *Odontosyllis hyalina* from the Philippines and Singapore. The ocular region in this species is so unusually large as to simulate the condition in the Alciopidæ. Eleven Syllidians are given in the same author's Annulata Œrstediana, chiefly from St. Croix, one of the Windward Islands; while only one species from West Africa was procured by the "Gazelle." A single new example also is described by Marenzeller from Southern Japan, but having the peculiarity of a "wing" at the tip of the bidentate terminal pieces of the bristles. Twelve species are mentioned by Schmarda, but his descriptions are somewhat indefinite.

In the present collection none occur beyond 600 fathoms, but in the "Porcupine" Ehlers[1] describes a form (*Syllis abyssicola*) from a depth of 1380 fathoms, and another from 1443 fathoms. They range to the littoral region; and especially abound in the waters of the Mediterranean, and those of Madeira, where they formed the subject of careful examination recently by Langerhans.[2]

Eusyllis, Malmgren.

Eusyllis tubifex, Gosse.

Habitat.—Dredged near Station 48 (off Le Havre Bank, Nova Scotia), May 8, 1873; lat. 43° 4′ N., long. 64° 5′ W.; depth, 51 fathoms; surface temperature, 38°·0; sea-bottom, rock.

The specimens are about the same size as the British examples, measuring 11 mm. in length and 1·5 mm. in breadth.

The body presents a slight narrowing from the anterior third backward, and is rounded dorsally, flattened ventrally.

The head shows four distinct eyes of considerable size, arranged along the limbs of a V. The tentacle rises from the central line, in a plane drawn between the two anterior eyes. The antennæ are somewhat shorter, but of similar shape, and spring from the anterior border in front of and slightly to the inner side of the anterior eyes. The palpi are distinct, and separated by a considerable interval. The tentacular cirri have a long dorsal and a shorter ventral division.

A few of the anterior dorsal cirri are long, the first exceeding even the dorsal division of the tentacular cirrus. They rapidly diminish, however, so that throughout the rest of the body they are of moderate length and slightly fusiform, narrowed at the base, dilating and then tapering to a blunt tip. The short setigerous division forms a

[1] *Ann. and Mag. Nat. Hist.*, ser. 4, vol. xiii. p. 295, 1874.
[2] *Zeitschr. f. wiss. Zool.*, Bd. xxxii. pp. 513–591, Taf. xxxi.–xxxiii., 1879.

truncated cone, the two pale spines reach the upper angle, while the tuft of moderately elongated bristles occurs beneath. The latter have short bifid tips, as in the British examples, from which, indeed, the specimen cannot be distinguished. The ventral cirrus constitutes a broadly lanceolate process, which is hardly so long as the setigerous region.

The distribution of this species would seem to be wide. Langerhans[1] found it at Madeira. It ranges from tide-marks to deep water.

Eusyllis kerguelensis, n. sp. (Pl. XXIX. fig. 4; Pl. XXXIII. fig. 3; Pl. XVa. fig. 13).

Habitat.—Dredged at Station 149H (off Christmas Harbour, Kerguelen), January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; surface temperature, 39°·8; sea-bottom, volcanic mud.

The fragments of the anterior end of this gigantic form measure from 12 to 18 mm., and the average breadth is about 5 mm., so that the size is considerable for the group.

The dorsal surface is somewhat rounded, the ventral flattened, and both are marked by the closely arranged grooves of the numerous segments. The head is distinguished by its irregular surface, for it is cut by longitudinal and transverse grooves into three areas. Anteriorly are two large flattened palpi, which appear to be exceptionally thin in contrast with others in the group. A somewhat elongated tentacle springs from the middle of the head, while anteriorly two shorter organs of a similar nature pass off from the margin of the snout above the palpi. The eyes occur nearly in the corners of a parallelogram, and the anterior pair are the larger, the pigment in the preparations passing so far over the anterior elevation as to be available for vision anteriorly and externally. There is a well-marked elevation on each side of the deep median groove, between the posterior pair of eyes; and outside the latter a distinct horizontal fold of the head, running to the median furrow behind. Two long, coiled tentacles are attached to each side of the buccal segment, in front of the feet, and somewhat elevated above them.

All the cirri and cephalic processes show a distinctly moniliform arrangement toward the tip, but the basal region is smooth. There is thus an intermediate condition between *Syllis* and *Eusyllis*, the former having articulated organs, the latter smooth.

In one example the proboscis is extruded, and it consists of a basal region marked by ten lamelliform papillæ arranged in a circular belt, each showing a depression in the centre of the summit, as if indicating a tendency to split. The next division, which issues telescope-like from the former, is deeper dorsally than ventrally, and terminates in a thin edge. Just within the latter are ten conical papillæ, one being situated in the

[1] *Zeitschr. f. wiss. Zool.*, Bd. xxxii. p. 552, 1879.

median line of the dorsum, but ventrally one is placed at some distance on each side of the central line. The inner surface of the proboscis is occupied by a firm deep yellow horny layer (pharyngeal region), having a dorsal tooth and two prominent lateral ridges.

The first feet do not differ much from their successors, which, when fully developed (Pl. XXXIII. fig. 3), present dorsally a very long cirrus with a short basal segment, its lower region appearing to be smooth in the preparation, while the distal is distinctly annulated. The setigerous process of the foot has a prominent conical papilla anteriorly and superiorly, the outline from this part sloping downward and inward. The bristles are pale, faintly tinged of a light straw colour, shafts and tips alike diminishing from above downward. The shafts (Pl. XVa. fig. 13, one of the longer forms) present the usual dilatation at the end, are devoid of transverse bars, have a slight curve, and are quite translucent. The somewhat elongate process has a terminal hook and a spur beneath. Instead of the two black spines so common in the Hesionidæ, there are five or six slender translucent spines. The ventral cirrus is modified into a huge lobe with a bluntly pointed tip, the whole being nearly as large as the rest of the foot.

The stomach and its cæcal appendages agree with those of the Syllidæ.

The specimens were sexually mature, two being laden with ova, which filled the lateral perivisceral regions.

In this form the hypoderm is largely developed over the dorsal region, but is comparatively thin on the ventral surface, so that the somewhat small nerve-area is slightly protected. The ventral longitudinal muscles are flattened, and the oblique are not strongly developed, though some of the fibres pass over the outer border of the nerve-area. Numerous ova occur in the perivisceral cavity anteriorly, chiefly arranged in a thin layer around the proboscis. The chief muscular mass of the latter is lateral, and in the preparation it is peculiarly waved and frilled. Moreover, this layer tapers off to a hiatus dorsally and ventrally, since the hypodermic and cuticular layers with an external band of transverse muscular fibres alone occupy the middle line.

At first sight this remarkable form resembles one of the Hesionidæ, the long cirri and the great size being especially striking; but a careful consideration of the structure of the head and its appendages, the structure of the feet and that of the proboscis with its tooth, ten distal and ten proximal papillæ, and other points, show that it is characteristically Syllidian. Langerhans,[1] apparently with reason, widens the original description of the genus by Malmgren, by admitting those with indistinctly articulated tentacles, but there is some doubt in regard to the species with simple tips to the bristles (*e.g.*, *Eusyllis kupffèri*, Langerhans) which he also includes. The grounds on which the latter are grouped with the former do not appear to me to be sufficiently reliable.

[1] *Zeitschr. f. wiss. Zool.*, Bd. xxxiii. p. 549, 1880.

Syllis, Savigny (Grube).

Syllis capensis, n. sp. (Pl. XXXIII. figs. 8, 9; Pl. XVa. fig. 21).

Habitat.—Dredged at Station 141 (off the Cape of Good Hope), December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms; bottom temperature 49°·5, surface temperature 66°·5; sea-bottom, green sand.

A minute example, between 5 and 6 mm. in length and barely 1 mm. in breadth. It is characterised by the short and boldly segmented cirri and other characters.

The head (Pl. XXXIII. fig. 8) is furnished with four brownish eyes situated in the arms of a wide V, and between them is the somewhat short tentacle. The antennæ and tentacular cirri are likewise short, and all are distinctly annulated. The palpi are of moderate length.

In the anterior third of the body the foot (Pl. XXXIII. fig. 9) presents dorsally a short cirrus of eight or nine segments. Beneath is an obliquely conical setigerous division, with two stoutish spines running to the upper angle. The bristles (Pl. XVa. fig. 21) have a somewhat elongated terminal appendage which is bifid. The ventral cirrus is lanceolate and of considerable breadth.

The tail is terminated by two short cirri.

This is probably a young form, and differs from Malmgren's[1] interpretation of the typical *Syllis* in having bristles with the terminal pieces bidentate. Langerhans[2] groups the somewhat varied representatives of this group under his subgenus *Typosyllis*, whether the bristles be simple or bidentate, but the subject seems to be in want of further elucidation. The short cirri, bifid terminal appendages to the bristles, and other points would indicate its relation to *Syllis armillaris* and similar forms.

Syllis gigantea, n. sp. (Pl. XXX. figs. 1, 2, 3; Pl. XXXIII. fig. 4; Pl. XVa. fig. 14; Pl. XXXIVa. fig. 7).

Habitat.—Dredged off Kerguelen, in 10 to 100 fathoms.

A large flattened form, fully 90 mm. in length, and, including the bristles, about 7 mm. in breadth at the widest region anteriorly.

The body is remarkably depressed, and divided into very numerous segments,[3] each of which bears a foot or its homologue. The body attains its maximum breadth about

[1] Annulata Polychæta, p. 41. [2] *Zeitschr. f. wiss. Zool.*, Bd. xxxii. p. 530 *et seq.*, 1879.

[3] The number has not been indicated, because there seems to be little value in such a character.

half an inch from the head, to which it gently tapers. The diminution from the same region to the tip of the tail is very gradual, the latter being by no means slender.

The head has two moderate frontal lobes, and, viewed from the dorsum, it seems to be broader in front than behind. The ocular region on each side is elevated into two prominent lobes, which form two lateral bosses posteriorly, a considerable part of each extending behind the posterior eye. The eyes are situated in the arms of the usual V, the anterior being about twice the size of the posterior pair, somewhat ovoid, and with a trace of a "lens." Their position is such that they look slightly forward as well as upward. The second pair follow after a short interval, and are rounded. Above the base of each frontal lobe is a tentacle (antenna of some authors) shorter than the median, and crenulated by the annulations. The ordinary tentacle springs from the centre of the head, rather in front of the first pair of eyes, and, like the previous processes, is somewhat narrowed at the base, while the tip is little tapered.

The buccal segment bears two cirri in place of a foot on each side. Inferiorly the margin of the mouth forms a disk symmetrically divided into eight lobes. The first foot follows, bearing dorsally a long thickish cirrus only slightly tapered at the tip, and composed of numerous segments, next a setigerous process and inferiorly a lanceolate ventral cirrus.

When fully formed the foot anteriorly (Pl. XXXIII. fig. 4) presents a dorsal cirrus which assumes a somewhat fusiform shape, from the slight diminution at the base and tip. There are about twenty-five segments in the cirrus besides the basal region, which is formed by a prominent process of the body-wall. The setigerous region is moderately elongated, its prominent superior apex having two short papillæ, from which its margin slopes downward and inward. It has about six spines, and a series of stoutish bristles (Pl. XVa. fig. 14) with short simply hooked terminal processes. The ventral cirrus is a somewhat broad, tongue-shaped lobe, with its concave surface directed upward. Its tip projects a little beyond the setigerous region.

Posteriorly the chief changes in the foot are the increase in the length of the dorsal cirrus (which also tapers slightly from base to apex), its more numerous and evident annulations, which amount to about forty-two. The setigerous region is smaller than in front and has four spines. The bristles pass out beneath the latter as anteriorly. The basal region of the ventral cirrus is slightly broader than in front, and its tip more tapered.

The anus occurs as a terminal aperture posteriorly, and in the preparation no process remains at the sides. The last foot, which adjoins the aperture, is little differentiated.

In transverse section (Pl. XXXIVa. fig. 7) the cuticle is remarkably thick, especially on the ventral surface. Outside the nerve-area is the circular coat, and then apparently hypoderm, though the cut ends of fibres appear to be present. The oblique muscles pass below the cords and meet in the middle line; moreover, a few fibres pass obliquely over the nerve-area from the one to the other. The longitudinal ventral

muscles present a feature not unfrequently seen in the great muscles of the Nemerteans, viz., they are cut into fasiculi by radiate bands, which pass somewhat regularly from the circular coat through the longitudinal ventral to the oblique, and at intervals upward to the longitudinal dorsal muscles. This arrangement and the dense cuticle are probably in connection with the peculiarly flattened body, for the vertical muscular bands conduce greatly to the strength laterally. The proboscis shows a fan-like arrangement of folds which radiate outward from the hypodermic lining. The wall of the succeeding region of the canal is peculiarly spongy, a condition probably due to the arrangement of the muscular fibres and glands.

The great size and flattened form of the body, the elevations on the head, and the comparatively small frontal lobes, are all characteristic features in this species. The pharyngeal region presents the usual chitinous structure internally, with a crown of horny papillæ in front, while externally a series of large glands are arranged longitudinally. The elongated proventriculus has a thick wall composed chiefly of radiate fibres and glands over an inner lining.

Syllis setubalensis, n. sp. (Pl. XXX. figs. 5, 6; Pl. XXXIII. fig. 6; Pl. XVa. figs. 16, 17).

Habitat.—Dredged at Station II. (off the coast of Portugal), January 13, 1873; lat. 38° 10′ N., long. 9° 14′ W.; depth, 470 fathoms; surface temperature, 57°·0; sea-bottom, green mud.

A small species in a fragmentary state. It measures about 4 mm. in length and 1 mm. in breadth.

The body is tinged pale brown in spirit, is convex dorsally and flattened ventrally. It is characterised by the peculiar rasp-like appearance given to a considerable portion of the anterior third of the dorsum by the proventriculcus, which seems to attain a large size in this form.

The head (Pl. XXX. fig. 5) is short in its antero-posterior diameter, wide transversely. The eyes are comparatively large, situated close together on each side, and in the arms of a very wide V. As usual, the anterior pair are the larger, and from the width of the head the pairs on the respective sides are separated by a long interval. The median tentacle arises from the centre of the head, between the eyes; and on each side in a line with the latter is the antenna. These processes are all long, slender, and moniliform (from segmentation). The anterior border of the snout is occupied by two large bluntly conical flattened frontal lobes (palpi), which exceed those of most forms in size. They project beyond the extruded horny pharyngeal region, which forms a brownish trumpet-like

organ on the ventral surface (Pl. XXX. fig. 6). The density of the pharyngeal wall is noteworthy. The buccal segment bears the usual pair of cirri on each side.

The complete anterior foot (Pl. XXXIII. fig. 6) has dorsally a very long, slender, moniliform cirrus of about thirty-three segments. The organ tapers from the short basal division to the apex. The setigerous region is bluntly conical, and bears a few stout bristles (Pl. XVA. fig. 16), the shafts having dilated ends of the type common amongst the Syllidæ, but no example possesses a terminal appendage; indeed, from the "finished" state of the tips of the shafts such would seem to have been their ordinary condition. The ventral cirrus has the form of a slender tongue-shaped process, the tip extending decidedly beyond that of the setigerous region.

Posteriorly the dorsal cirri become more slender, and the ventral somewhat shorter, so that they do not quite reach the tip of the setigerous region. The bristles are fewer than in front, only one or two being, as a rule, present. They are stout, and have the tips curiously modified (Pl. XVA. fig. 17), like those of *Syllis gracilis* of the Channel Islands. The tip of the shaft is minutely bifid, this modification affecting the part which forms the articular edge in other bristles of the same nature.

As indicated by the bristles, this form approaches the group containing *Syllis gracilis*, Grube, but is especially allied to *Syllis spongicola*, Grube,[1] a species not uncommon in the Mediterranean, and also at Madeira. The cirri in the present species seem to be considerably longer, and the structure of the bristles is diagnostic. It is interesting to note that in some forms, as in Grube's *Syllis vancaurica*,[2] and in *Eusyllis*, Malmgren, the posterior bristles deviate considerably from the anterior. These differences are well shown by Marenzeller in *Eusyllis assimilis*.[3]

Syllis brasiliensis, n. sp. (Pl. XXX. fig. 7; Pl. XXXIII. fig. 7; Pl. XVA. fig. 20).

Habitat.—Dredged at Station 122 (off Barra Grande, Brazil), September 10, 1873; lat. 9° 5′ S. to 9° 10′ S., long. 34° 50′ W.; depth, 350 fathoms; surface temperature, 77°·5; sea-bottom, red mud.

A form about the size of the last-mentioned species, and also furnished with a large proventriculus, which gives a rasp-like appearance (from the transparency of the integumentary tissues) to the region occupied by it. The dorsum is prominent and much arched, the ventral region marked by a groove.

The head (Pl. XXX. fig. 7) possesses a similar form to that in *Syllis setubalensis*, *i.e.*, has a short antero-posterior and a long transverse diameter. The four very distinct blackish eyes are similarly arranged. The tentacle springs from the middle of the head

[1] *Archiv f. Naturgesch.*, 1855, p. 104. [2] Annel. Novara-Exped., p. 25, Tab. iii. fig. 2, *c*.
[3] Zur Kenntniss d. adriatischen Annel., p. 30, Taf. iii. fig. 2, B.

between the eyes, and it and the antennæ are long, slender, and moniliform. The pharyngeal region is extruded, as in the foregoing form, but its colour is dusky greyish, and it is not so horny. The palpi (frontal lobes) form two large, bluntly conical, flattened organs projecting from the snout.

The feet are furnished with longer bristles than in *Syllis setubalensis*. The dorsal cirrus (Pl. XXXIII. fig. 7) is more decidedly tapered from base to apex, and has a variable number of segments, generally about forty-four. The setigerous division is less rounded at the tip, and anteriorly is supported by a single strong spine, the tip of which is dorsal. There are about four stoutish bristles beneath it, each with a minute yet distinctly bifid terminal appendage (Pl. XVA. fig. 20), while the distal end of the shaft has a small style. The whole appearance is such as might be expected from a further development of the form seen in *Syllis setubalensis*. The bristles retain the same characters in the posterior region of the body (which is more complete than in the previous species), so that there is an evident distinction between them in this respect. The ventral cirrus is shorter than in *Syllis setubalensis*, and does not reach a vertical line from the tip of the setigerous division. It is also less inclined upward at the tip, and posteriorly becomes even less prominent.

This species approaches certain forms of *Eusyllis* in regard to the terminal pieces of the bristles, but at the same time these appendages are much shorter than any known example. The terminal pieces also differ considerably from those of *Syllis gracilis*, Grube.

Syllis robertianæ, n. sp. (Pl. XXXIV. figs. 1, 2; Pl. XXIXA. fig. 14).

Habitat.—Trawled at Station 320 (off the coast of Buenos Ayres), February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom temperature 37°·2, surface temperature 67°·5; sea-bottom, green sand. It was in an incrusting Sponge on the tube of *Pista mirabilis*.

The specimen is 13 mm. in length, and fully 1 mm. in diameter anteriorly.

The body tapers gradually from before backward. The head is elongated transversely, the antero-posterior diameter being very short. The palpi are bluntly conical when viewed from the dorsum, and ventrally present the usual bulbous extremities. There are four eyes, situated along the arms of a very wide V. The anterior pair are much farther apart, are twice as large as the posterior, and quarter moon-shaped, the concavity being in front. The posterior pair are circular. The median and anterior tentacles are about the same length, and all are evidently articulated as well as very fragile. The tentacular and dorsal cirri are, like the former, elongated, about forty-one or forty-two articulations occurring in the dorsal. These organs are gradually tapered from base to apex.

The setigerous region of the foot (Pl. XXXIV. fig. 2) is bilobed, and furnished superiorly with three spines, which do not project beyond the surface, and inferiorly with a group of stout bristles (Pl. XXIXA. fig. 14), having somewhat short distal appendages. The anterior edge of each of the latter presents one or two serrations, besides the well-marked bifid tip, which resembles that in *Eusyllis*. The ventral lamella is lanceolate or ovato-lanceolate, the tip projecting about as far as that of the setigerous region.

This species differs from *Syllis brasiliensis* in the shape of the palpi, the arrangement of the eyes, in having the distal ends of the shafts of the bristles less abruptly dilated, and in the more elongated bifid appendages. By the former character it is easily distinguished from *Eusyllis tubifex*, Gosse, the bristles of which are closely allied.

Syllis ramosa, M'Intosh (Pl. XXXI. fig. 1; Pl. XXXIII. figs. 11, 12, 13, 14; Pl. XVA. figs. 18, 19; Pl. XVIA. fig. 1; Pl. XXXIVA. figs. 8, 9, 10, 12, 13).

Syllis ramosa, M'I., Journ. Linn. Soc. Lond. (Zool.), vol. xiv. p. 720, 1879.

Habitat.—Trawled at Station 192 (off Tionfolokker Islands in the Arafura Sea), September 26, 1874; lat. 5° 49′ 15″ S., long. 132° 14′ 15″ E.; depth, 140 fathoms; surface temperature, 82°·0; sea-bottom, blue mud. Also at Station 209 (near Zebu, Philippines), January 22, 1875; lat. 10° 14′ N., long. 123° 54′ E.; depth, 95 fathoms; bottom temperature 71°, surface temperature 81°; sea-bottom, blue mud.

In both instances the ground was peculiarly rich in *Euplectellæ* and other Hexactinellid Sponges and *Sipunculi*, the canals of the former, especially just above the "wisp," being occupied by this remarkable Annelid in great numbers. It was not observed in life. Besides the *Syllis*, the sponge in one instance was tenanted by *Polynoë hexactinellidæ*.

The Syllidian (*Syllis ramosa*) is located for the most part in the basal canals of the sponge, above the wisp. In this region masses of the Annelid, about a quarter of an inch in diameter, occur, and a multitude of branches pass into the smaller canals adjoining. Two of such masses are especially conspicuous. The intricate manner in which the branches are arranged makes it a very difficult matter to dissect them out, especially when the friability of the Annelid and the sharp spicules of the sponge are taken into account. Even after removal from the sponge it is a laborious operation to unravel them without frequent rupture.

The masses and their numerous branches, as well as the isolated portions, consist of a *Syllis*-like Annelid of the thickness of common sewing-thread. In the specimen within a sponge from Zebu, which was first sent me, no head can be observed either in the parent-stock, amongst the masses, or in the canals elsewhere, so that they must either be very few, only occasionally developed, or by some means have been swept off, as it is hard to

believe that they are entirely absent. The latter, however, must be the condition in some of the examples (unless we are to suppose that all are connected with a single head), which, therefore, would appear to derive nourishment at the open end; yet, in many, the aperture rapidly develops a bud, which nearly closes it. In several instances smoothly finished ends occur, some showing a yellowish opacity in which the alimentary canal terminates, and evidently indicating the development of a new bud; while others have a wide aperture with a smooth edge at which the digestive tract is abruptly truncated. If, in life, there be many examples with such open ends, then the whole series branching from them presents an analogous condition to that of very elementary animals, the food being swept in with the sea-water to traverse the moniliform nutritive canal throughout the organism.

In examining the examples recently sent from Station 192 (Arafura Sea), one of the fragments presented a peculiarly broad body, which came off at right angles from an elongated piece (Pl. XXXIVa. fig. 8), and had shorter segments as well as a wider and more distinctly moniliform alimentary canal. Moreover, the free end possessed a head. The latter is opaque and more massive than the rest of the body, and presents dorsally a somewhat uneven surface. The anterior margin of the snout is depressed, and carries on each side a slender cirrus, and a little behind and just in front of the eye another appendage of the same kind. A sulcus separates this area from the more elevated one behind, the latter resembling a broad wedge with the eye on each angle anteriorly. The ocular pigment is dark red, and not rigidly defined at the edge, indeed, on the left side a few small points occur to the exterior of the larger. The folds on the posterior region of the head are symmetrical, and the nuchal border is clearly marked. Inferiorly the snout has a deep sulcus (the mouth) at the posterior region of the head and buccal segment. A minute and somewhat flattened lobe appears on each side of the snout, just in front of the oral depression, and it is possible that this is the homologue of the palpus. The mouth passes into the alimentary canal, which emerges from the opaque cephalic mass as a broad tract. There is no further differentiation in the canal than is seen in ordinary specimens, the dilated portions in the figure being probably due to pressure in unfolding the compressed example. The structure of the feet also corresponds with the subsequent description.

The body of the animal stretches, from any of the broken ends, of a nearly uniform diameter, a considerable distance, the numerous narrow segments being distinctly marked, and each furnished laterally with well-formed feet. The latter (Pl. XXXIII. fig. 14) have dorsally a long, and often gracefully curved cirrus, composed of a variable number of segments, since injury and reparation constantly occur. The longer cirri have about twenty-six segments, and all the organs are gently tapered from base to apex. The shorter cirri, which alternate with the former, have about fifteen segments. Beneath, and confluent with the base of the cirrus, is the somewhat conical setigerous region

(Pl. XVIa. fig. 1), which has a few simple bristles, each with a stout and slightly curved shaft, the dilated distal portion having the terminal process apparently ankylosed to it, a peculiar modification in such bristles. In many the convex edge of the distal region of the shaft is slightly serrated, as also the corresponding (concave) edge of the terminal piece, the last serrature under the hook at the tip being especially conspicuous, so as to give a bifid condition in the best-marked bristles, these features being developed most distinctly in the specimens from off Tionfolokker Islands. A single stout spine supports the setigerous region, and, as usual, its point passes to the upper border. The ventral cirrus is broad and short, its tip being within the line of the former division.

The body of the Annelid appears to have a great tendency to budding—laterally, terminally, and wherever a broken surface occurs. The young buds remain slender till they have reached a considerable length, and into each a diverticulum of the alimentary canal of the parent enters. These buds, on attaining a certain size, by and by give off other buds, so that the whole has a remarkably branched condition. The tail of the bud (*i.e.*, its distal point) is early formed, and soon becomes furnished with two long cirri. Indeed, it would seem that in such a case the tail and the anus were more useful than the head, the eyes, and the finished buccal region and the pharyngeal apparatus.

The number of buds seems to be indefinite, the data at present being insufficient to enable me to fix a limit. Some of the larger fragments show nine or ten buds, yet they are evidently far from being complete. In one instance, a narrow branch left the main trunk in the usual manner, and shortly after its commencement gave off three buds from the same spot, while the original branch pursued its way outward. The first bud is very rudimentary, and is barely segmented, but the second and third consist of many somites, one, however, being considerably larger and longer than the other. No less than five branches thus radiate from this prolific spot.

Several female buds were found. One of these (Pl. XXXIII. fig. 11) is still attached by its pedicle of four segments to the parent-stock. These intermediate segments somewhat resemble those of ordinary buds, only they are more slender. All have rudimentary lateral cirri and setigerous processes. The diverticulum of the alimentary canal proceeds from the main trunk in the ordinary way, passes through the anterior segments of the bud, and becomes lost in the opacity caused by the ova. The head of the bud is bilobate, and somewhat like the sexual form described as *Ioida* by Dr. Johnston, furnished dorsally with a large reddish-brown eye on each side, and a still larger pair, of similar shape (somewhat circular) and colour, on the ventral surface. These eyes, while useful for both dorsal and ventral vision, approach so near the margins that they are also available for lateral sight. The head is terminated posteriorly by two short cirri and a setigerous process furnished with a spine.

The body of the female bud is somewhat fusiform, gradually increasing in diameter till full breadth is attained, and, after a nearly cylindrical region, diminishing toward

the tail, though to a less degree than anteriorly. The entire body, from the middle of the second segment backward, as well as the bases of the feet, is filled with ova, each of which shows germinal vesicle and spot. The anterior segments are provided with bristles of the same type as the parent stock (Pl. XVa. fig. 18), only the terminal appendage is more differentiated. None of the long simple bristles are apparent in this fragmentary example.

Exactly opposite the point from which the pedicle of the foregoing bud arises is another small one, consisting of upward of a dozen segments. Moreover, in the same specimen, a pair of young buds occur opposite each other. In these cases the segment of the intestine of the parent-stock, from which the diverticulum proceeds, is shorter than the rest. It would seem that the bud arises opposite a foot, and there is no evidence that it ever springs between two (successive) feet. The shortening of the intestinal segment may be due to the appropriation of the substance of both it and the body-wall in the production of the new bud.

A free female bud, again, occurred in one of the basal canals of the sponge. It (Pl. XXXIVa. fig. 9) closely agrees with the description of the previous specimen, except in the larger garnet-tinted eyes, the dorsal and ventral pairs being more nearly equal, and the presence of beautiful tufts of long simple bristles (the "Pubertätsborsten" of Prof. Langerhans) in each foot. Its length is about 9 mm., and its breadth, including the bristles, rather more than 2 mm. There are twenty-nine segments, but the condition of the tail is open to doubt. Dorsally (Pl. XXXIII. fig. 12) each segment has a slender and distinctly jointed cirrus. Beneath the foregoing is a dense tuft of long, translucent, simple bristles, with broad flattened tips after the fashion of the straight Roman swords, but marked at the tip by two peculiar longitudinal processes, and sometimes the end assumes a fimbriated appearance (Pl. XVa. fig. 19). The setigerous region beneath is short and conical, having superiorly the spine and inferiorly the bristles, which differ from those of the parent-stock in showing a more evident differentiation at the junction of the terminal process. Ventrally is a tongue-shaped cirrus, which nearly reaches the apex of the setigerous region. The entire body is filled with ova, which likewise occupy the feet almost to their tips, the first segment and the extremity of the tail (which is apparently in process of regeneration) alone being devoid of them. Some of the feet, indeed, assume a bulk four or five times larger than the others, from distention with ova. The latter apparently have embryos internally.

Another free female bud (Pl. XXXIVa. fig. 10) amongst the specimens from the Arafura Sea, differs somewhat from the foregoing, and probably represents a younger stage, though the example has thirty-one segments. It is not in good preservation. Instead of the smooth, bifid snout and two large eyes, the anterior margin presents no notch anteriorly, while a minute cirrus appears on each side. The eyes are small and wide apart, and a similar pair occur ventrally. The ova are smaller (less developed)

than in the previous form, and no long bristles are present. The commencement of the alimentary canal is clearly seen, but is soon lost in the opaque mass of ova.

In the specimens from the Challenger, only a fragment of the posterior end of a male example was procured, but in the fine example of the sponge kindly forwarded from the Oxford Museum by Prof. Moseley a perfect male occurred. This dorsally presents a head (Pl. XXXIVA. fig. 12) with a median notch to which apparently a process from the body of the parent-stock had been attached. The sides form two symmetrical but irregularly rounded lobes, a small eye being situated anteriorly and towards the outer border on each side. The eye is circular and smooth in outline, as if surrounded by a special capsule. On the ventral surface a much larger pair of eyes are situated somewhat behind and internal to the dorsal. The head seems to have a single tentacular process. Immediately behind the head on each side are a pair of connate processes, probably developing feet. Seven segments which follow the foregoing are somewhat narrower (transversely) than their successors, the feet especially being less developed. Each has a short dorsal cirrus, a tuft of bristles with stout shafts and short terminal pieces, which appear to have simple tips. One or two of the posterior segments of this division also have a short tuft of simple bristles, but these do not project conspicuously from the foot. The succeeding region of the body, which in the specimen consists of about twenty-six segments, gradually diminishes to the posterior extremity, at which is the anus, with a minute (developing foot) at each side (Pl. XXXIVA. fig. 13). The alimentary canal leads from the anterior central notch straight through the body to the posterior end.

The feet (Pl. XXXIII. fig. 13), which are well marked and long, have dorsally a slightly convex margin; ventrally the outline is also somewhat tumid at the base, but curves upward toward the tip. A short cirrus of four or five segments extends from the extremity of the dorsal margin, while beneath it is a dense tuft of long, straight, sword-shaped translucent bristles, similar to those described in the female bud. A flat papilla, about the middle of the bristle-bundle, shows that part of the foot to which the tip of the slender supporting spine proceeds. This slender spine diverges upward from the side of the stronger inferior one, the arrangement of the parts indicating that the foregoing tuft of simple bristles is of less morphological value than the others. A somewhat lanceolate process occurs at the ventral margin of the foot, and apparently corresponds to the setigerous division. It is supported by the stronger spine, and bears two or three bristles with simple terminal processes, similar to those in the parent-stock. The enlarged feet evidently greatly aid in storing the spermatozoa, and they have a series of muscular fibres, which form a closely arranged investment, crossing if not interweaving with each other. The cavity of each foot is occupied by a granular mass, which in some clearly shows the forms of spermatozoa.

The condition of the specimens renders the structure of the body-wall indistinct,

but it appears to conform to the ordinary type, though the longitudinal muscular layer is comparatively thin. The softening of the nerve-cords seems to have rendered their area diffuse.

Syllis ramosa agrees with Grube's "stolones"[1] in having no proper pharynx and proventriculus. The entire animal and its branches seem to be devoid of such, and yet the structure of the greater part of it is more in keeping with the ordinary type seen in *Syllis*. The large eyes of the female buds correspond with those in the "stolones."

Several species from the Philippines are described by Grube, in which an alternation of long and short dorsal cirri occur. Thus, for example, *Syllis lycochætus*,[2] from Samboangan, has long cirri of forty or fifty segments, and shorter with about half the number; while *Syllis flaccida*[3] has from twenty-five to thirty joints in the shorter cirri, and from forty to fifty-five in the longer.

The only known marine forms in which gemmation occurred were those in which the posterior segments of certain forms gave off buds in linear series. Thus amongst the Derostome Rhabdocœla Dugès found in southern France a form which he termed *Catenula*, characterised by its linear budding. Two marine examples of the same genus were procured by Schmarda, one from South Africa and the other from New South Wales. The species from the Cape forms a chain of several individuals. Oscar Schmidt,[4] again, in the same group has described the linear division of a *Microstomum*, and similar gemmation also occurs in *Stenostomum*. Amongst the Annelids it is more than a century since O. F. Müller observed the budding of *Nais proboscidea*. He mentions two varieties of this fission, viz., first, in which the last segment sprouts forth into a number of body-rings, the posterior being the oldest, and the anterior the youngest as well as the smallest. The second kind occurs when the body has attained forty segments, for then a division begins in the middle, two bodies of twenty segments each being formed; and Max Schultze[5] and others have subsequently extended our information on this subject. The former maintained that the separation took place, not between two rings as O. F. Müller stated, but in the middle of a segment. He also found that when the parent-stock had been reduced to twelve or fourteen segments the budding process ceased. The former author also mentioned the division of *Chætogaster vermicularis*; and this habit in the same genus has further been elucidated by Gruithuisen, von Baer, Ehrenberg, D'Udekem, O. Schmidt, and Ray Lankester. O. F. Müller also pointed out the fissiparous condition in *Syllis prolifera*, in which a similar new body was attached to the old, apparently in the form of a tail. De Quatrefages[6] met with a similar species on the coast of Brittany, and, like Müller, he found that the buds alone showed the sexual elements. Milne-Edwards[7] described the same features in *Myrianida*, from Sicily, in which a new

[1] Annelidenfauna d. Philippinen, p. 110. [2] *Ibid.*, p. 117. [3] *Ibid.*, p. 118.
[4] Neue Beiträge zur Naturgesch., &c., Rhabdocœlen Strudelwürmer, 1848, p. 57.
[5] *Archiv f. Naturgesch.*, 1849, pp. 293–304. [6] *Ann. d. Sci. Nat.*, sér. 3, t. i. p. 22, 1844.
[7] *Ibid.*, t. iii. p. 17, 1845.

individual was developed between the penultimate and the last segment. In our own country it is one of the most remarkable sights in the group to observe the parent-stock of this form moving gracefully about with a long string of buds at its posterior extremity. Frey and Leuckart[1] extended the history of the subject by a careful examination of *Syllis prolifera* from the North Sea. They observed in the line between two segments a new process which forms an interpolated segment, and this, as a real bud of the anterior moiety of the animal, is developed after the manner of such structures, and by degrees is separated as a complete individual. From these observations, indeed, and his own on *Nais proboscidea*, Max Schultze concluded that the former was a clear case of fissiparous development, whereas in the latter a division takes place. Greeff[2] also gave an account of the usual budding in *Autolytus prolifer* from Heligoland. Frey and Leuckart did not find the generative products fully developed in their examples of the buds; but Krohn[3] made further observations a few years later, though he did not quite complete the history. The latter was accomplished by Alex. Agassiz,[4] who, in *Autolytus cornutus*, described the parent-stock, and traced from the elements of the male and female buds the growth of the young embryo into a parent-stock. A similar but not identical mode of development occurs in the British *Proceræa picta*. In *Filigrana*, a genus of the Serpulidæ, Sars,[5] Oscar Schmidt[6] and Huxley[7] have shown that linear buds are developed posteriorly.

So far as the foregoing observations go, the specimens exhibited only linear budding, but in 1863 Alex. Pagenstecher[8] described what he termed lateral budding in *Exogone gemmifera*, from the Port of Cette. This, however, as Ehlers has pointed out, is only a further development of the condition formerly shown by Œrsted in his *Exogone naidina*, or as very early indicated by Martin Slabber. Nothing approaching to a lateral bud exists. As stated in 1868,[9] Vaillant's[10] supposed new instance of reproduction by budding is due to a misapprehension. The so-called buds appear to be the tentacles (furnished with pigment-spots at the tip) of a *Polycirrus* or closely allied form. With this view Ehlers[11] coincides.

Fissiparity similar to that in the Syllidians previously mentioned has occasionally been observed in other groups, as in the *Eulalia gracilis* of Verrill.[12] In this, one of the segments is larger than the rest, and develops a distinct pair of eyes. Langerhans, in one of his interesting papers on the Annelids of the Canaries,[13] describes an instance,

[1] Beiträge zur k. wirbell. Thiere, &c., 1847, p. 91.
[2] *Archiv f. Naturgesch.*, 1866, p. 352.
[3] *Archiv f. Naturgesch.*, 1852, p. 66.
[4] *Journ. Boston Soc. Nat. Hist.*, vol. vii. p. 392.
[5] Fauna litt. Norvegiæ, p. 86.
[6] Neue Beiträge zur Naturgesch. d. Würmer, Jena, 1848, p. 33.
[7] *Edin. New Phil. Journ.*, January 1855, p. 113.
[8] *Zeitschr. f. wiss. Zool.*, Bd. xii. p. 267, Taf. xxv., &c.
[9] *Trans. Roy. Soc. Edin.*, vol. xxv. p. 309.
[10] *Ann. d. Sci. Nat.* (Zool.), sér. 5, 1865, p. 243, pl. iii.
[11] *Op. cit.*, ii. p. 15.
[12] Report of U.S. Commissioners of Fish and Fisheries, &c., 1873, p. 586.
[13] *Nova Acta Acad. Cæs. Leop.*, &c., Bd. xlii., No. 3, Halle, 1881, pp. 95–105.

again, of two fairly formed heads followed by a few segments occurring at the anterior end of *Typosyllis variegata*, Grube. The heads pass off obliquely from the body.

From the foregoing remarks it will be observed that in no group of the Annelids is budding more conspicuous than in the Syllidæ, and it is therefore not surprising that the remarkably branched form should have occurred in the same family. It is unique in the multiplicity of its divisions, which are all connected together by the body-wall and alimentary tube, and to which the size of the sponge alone fixes a limit. This much branched body is evidently the parent-stock, from which the male and female buds are produced, the resulting embryos conveying the species to new sites in other sponges.

It had been observed, even in the days of Aristotle, that worms dwelt in sponges, and the occurrence of such forms as the phosphorescent *Eusyllis* under Sponges and Ascidians fixed to stones is a frequent occurrence in the littoral region in Britain. Though not uncommon in the Hirudinea, ectoparasitism in the chætopodous Annelids is rare, the chief examples being observed in *Stylaria*, *Chætogaster*, and other Naides. In the marine forms, again, commensalism is common, many examples inhabiting the tubes of others, taking shelter under the mantle of mollusks, or in the ambulacral grooves of starfishes. Fritz Müller found an Amphinomian in the respiratory cavity of *Lepas anatifera;* and amongst other examples is *Alciopina parasitica*, which Claparède discovered in *Pleurobrachia densa*. In *Euplectella* one of the Polynoidæ occurs, and in an Ascidian another of the same family. Thus the presence of *Syllis ramosa* as a commensalistic form in the sponge is not remarkable. It is the unique power of branching which is noteworthy.

Exogone, Œrsted.

Exogone heterosetosa, n. sp. (Pl. XXXIII. figs. 15, 16; Pl. XXIVA. fig. 11).

Habitat.—Dredged at Station 144A (off Marion Island), December 26, 1873; lat. 46° 48′ S., long. 37° 49′ 30″ E.; depth, 69 fathoms; surface temperature, 41°·0; sea-bottom, volcanic sand. It was found amongst the bristles of *Lagisca antarctica* during the examination of that form.

A minute species, about 3 mm. in length and a third of a mm. in breadth.

The body consists of thirty-four segments, which have a greater transverse than antero-posterior diameter, the latter attaining its greatest proportion posteriorly. The tail has a pair of cirri of considerable length.

The head (Pl. XXXIII. fig. 15) has anteriorly a pair of bluntly conical frontal lobes, which have a thin bridge along the middle line. A pair of eyes occur on each side, the axis of the pairs being directed forward and outward. The anterior on each side is the larger, and has a conical "lens." A short lateral cirrus is placed on each side of the head anteriorly, and there seems to be a median of similar length, though the state of the

preparation renders its presence doubtful. The pharyngeal region presents the usual anterior tooth. The proventriculus shows only the transverse striation of the compressed muscles in the preparation, but glandular papillæ are probably present internally.

Each foot has dorsally a short and somewhat cylindrical cirrus, which, in the compressed specimen, does not project so far outward as the setigerous region. The latter anteriorly bears a tuft of jointed bristles, the shafts of which are for the most part curved below the dilated tip. The distal appendage is minute, with a terminal hook and a basal projection, so that it appears bifid (Pl. XXXIVA. fig. 11). Two other singular bristles occur in the same group: one is a long and slightly curved form with an oblique tip like a beak (probably a modification of the shaft of the jointed kind); the other has a shaft of similar length, which distally is flattened out so as to form a spathulate tip with a terminal filament, as in certain Sabellidæ and in *Magelona*. In addition to these, at and behind the twelfth foot, a tuft of long and very fine hair-like bristles is present. These are often broken, as in the figure.

Seven segments (viz., from the sixteenth to the twenty-second bristled segments) of the body posteriorly are filled with the reproductive products, and are densely granular and opaque, while two early embryos are in proximity externally (Pl. XXXIII. fig. 16). The latter are somewhat conical, one end being blunt, with two lateral bosses and three median cirri; the other, apparently the posterior, being pointed and furnished with at least one cirrus above the termination (the other perhaps having fallen off). The central region of the embryo is occupied by the same deep yellowish granules as in the body of the adult, while externally there are traces of several feet.

The embryos of this genus somewhat resemble those of *Syllides pulligera*, Krohn. The minute size of this form renders its diagnosis somewhat difficult, but it leans rather to *Exogone* than to any of the allied genera.

Sphærosyllis, Claparède.

Sphærosyllis kerguelensis, n. sp. (Pl. XXIX. fig. 5; Pl. XXXIII. fig. 10; Pl. XVA. fig. 22).

Habitat.—Dredged at Station 149H (off Cumberland Bay, Kerguelen), January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; surface temperature, 39°·8; sea-bottom, volcanic mud.

A minute example, barely 5 mm. in length and less than 1 mm. in breadth.

The body has a fusiform shape, rather more tapered posteriorly than anteriorly, and comprising twenty-six setigerous segments.

The head (Pl. XXIX. fig. 5) is smoothly rounded, but with a slight indentation in the middle line anteriorly. Two somewhat ovoid eyes occur, immediately in front of the first bristle-bearing segment, and behind the first (or buccal) lateral cirri. Such specks may represent the conjoined eyes of each side. In front of each eye (indeed separated by a considerable interval) is a short process, probably the homologue of the antenna. It hardly projects beyond the margin of the head. The pharyngeal and proventricular regions of the alimentary canal are well developed.

Each foot (Pl. XXXIII. fig. 10) carries superiorly a dorsal cirrus, the lower division of which forms an ovoid swelling, while the distal part is somewhat filiform. The whole process is very short, and its surface is sparsely covered with wart-like papillæ. The setigerous region has about five minute and somewhat slender bristles (Pl. XVa. fig. 22) which emerge beneath the two spines (at the tip of the foot superiorly). The terminal appendage has a simple hook. The ventral cirrus is a short, slightly tapered process, which is considerably shorter than the setigerous region. Its surface likewise has a few warty papillæ.

Posteriorly the tail has two short cirri on each side of the anus.

The genus *Sphærosyllis* was established by Claparède[1] in 1863 for two forms which he procured on the coast of Normandy, and the characters were amended in 1868.[2] The Syllidians included in the genus are characterised by two large coalesced palpi, separated by a median sulcus. Pharynx straight and with a single tooth. Proventriculus follicular, and the stomach short. Three antennæ; one pair of cirri on the buccal segment; other segments with dorsal and ventral cirri. Antennæ and cirri with tumid bases but not moniliform. No alternation of generations.

The present example shows certain differences from the foregoing generic description, but it does not seem to approach any other form more closely. It appears to be a young specimen.

Autolytus, Grube.

Autolytus macleauranus, n. sp. (Pl. XXIX. fig. 6; Pl. XXXIII. fig. 5; Pl. XVa. fig. 15).

Habitat.—Dredged at Station 149E (off Greenland Harbour, Kerguelen), January 21, 1874; lat. 49° 37′ S., long. 70° 16′ E.; depth, 30 fathoms; sea-bottom, volcanic mud.

A small form, about 13 mm. in length and 1·5 mm. in diameter.

The dorsum is slightly rounded, the ventral surface grooved in the middle, and marked laterally with the prominent cushions opposite each foot. The body tapers a little towards the tail.

[1] Beobachtungen über Anat. u. Entwickelung., &c., p. 45.

[2] Annél. Chétop., p. 204.

The head (Pl. XXIX. fig. 6) is somewhat small, the frontal margin unbroken, though slightly notched inferiorly, and there are two very distinct brownish eyes on each side arranged in the limbs of a V. The anterior pair are considerably larger. Just in front and to the inner side of each of the latter is an antenna, the base of which is thus considerably behind the frontal margin. They are moderately thick, curved outward, and show no traces of annulation. The tentacle is absent. The buccal segment bears a pair of cirri on each side, the inferior being shorter. The cirri have been removed from the next segment, but their bases are very large and distinct. The mouth opens as a longitudinal slit behind the axial groove on the snout.

The first foot follows the buccal cirri, and as usual it and several of its successors are furnished with longer cirri. When fully developed, each foot (Pl. XXXIII. fig. 5) forms a thick process, with a short dorsal cirrus, but without a differentiated ventral one. As formerly indicated, the region of the ventral cirrus on each side is occupied by a thick pad which extends over a third of the transverse diameter, the central and somewhat wider region being depressed, the whole forming an arrangement similar to that in the Sabellidæ and Terebellidæ. The dorsal cirrus is slightly tapered, and has no trace of annulation. The basal region (pertaining to the body-wall) is short. The rest of the foot forms a thick mass with a dimple opposite the tip of the spine, the upper region being convex, and the lower sloping inward to the body. The spines are pale and slender. The fifteen short bristles pass outward beneath the notch, and have the distal ends of the shafts dilated and furnished with a short bifid appendage (Pl. XVa. fig. 15). The feet on the whole seem to undergo little modification from the front to the termination of the body. The tail has two short cirri on each side of the anus, which is terminal.

In transverse section the body is found to be distended with the reproductive elements (apparently male). The nerve-area is comparatively superficial, and thus in contrast with the common British species, a form allied to *Syllis armillaris*, O. F. Müller, in which the ventral muscles almost meet in the middle line outside the cords. The distention from the growth of the reproductive elements, however, may to some extent alter the relation of the parts.

The bristles resemble those of *Autolytus*, and the form of the feet and other parts seem to point its connection with that genus.

Family Nereidæ.

The representatives of this large family are comparatively few, indeed only about half the number described by Prof. Grube in his Annulata Semperiana from the Philippines. This disproportion is probably due to the fact that the Nereides abound in shallow water

and on shore. Sixteen examples of the family are described by Schmarda, while Kinberg gives a list of no less than fifty from the "Eugenie." Even in the Challenger series the majority come from water less than 100 fathoms in depth, only one appearing from a notable depth, viz., from 1525 fathoms. Yet their bathymetric range is great, even *Nereis pelagica* passing from tide-marks to considerable depths in holes made by other animals in telegraph-cables. In the "Porcupine" Ehlers found *Nereis longissima* descend to 1366 fathoms.

No specimen of the pelagic Heteronereides occurs, though some, like the *Nectonereis megalops* of Verrill,[1] swim actively at the surface. No further light has thus been thrown on the peculiar transformations of the group, some examples of which probably change from tube-dwellers to pelagic animals on attaining sexual maturity, and which further increase the complexity by appearing as hermaphrodites as well as atocous and epitocous forms. The marked changes which the feet and bristles undergo in these Annelids are well known. Claparède's observation in regard to the comparative size of the atocous and epitocous forms is noteworthy, for he states that the examples of the latter are generally much smaller than the former. Further researches are indeed indicated, for it is remarkable that, like the American paradoxical frog, the incomplete form is larger than the adult. The genus *Nereilepas* is likewise absent from the collection, and yet this was the only one found by Chamisso and Eysenhardt[2] in their voyage round the world.

Certain forms have a very wide geographical distribution. Thus *Nereis pelagica*, Linn., is circumpolar, and *Nereis virens*, Sars, ranges from Europe to the east coast of North America. Others again are littoral, such as the group containing *Nereis diversicolor*, O. F. Müller, which has no epitocous development, while a few are local, as, for example, *Nereis cultrifera*, Grube. The three well known forms, *Nereis pelagica*, *Nereis diversicolor*, and *Nereis dumerilii* are included in Marenzeller's Japanese Annelids.[3]

The representatives of the Platynereid group are most numerous, and this feature is of interest in regard to the wide distribution of the British species (*Nereis dumerilii*, Aud. and Ed.). In this group the anterior lobes of the feet are blunt, the posterior being pointed; and the paragnathi form rows of minute points. Though some of the species superficially resemble *Nereis dumerilii*, the minute examination of the characters just mentioned, and a glance at the structure of the falcate bristles, indicate the separation. They simply take the place of that form.

In diagnosing the species, the general form of the head and anterior region, the arrangement of the paragnathi, the structure of the feet, and the minute structure of the bristles, are mainly depended on. The method followed in describing the proboscis and its paragnathi is that of Kinberg,[4] for in the present instance it will suffice, without giving

[1] Report of U.S. Commissioner of Fish and Fisheries, 1874, p. 592, pl. xii. figs. 62, 63, &c.
[2] De Animalibus quibusdam e classe Verm., vol. ii. p. 349.
[3] *Denkschr. d. k. Akad. d. Wiss. Wien*, 1879, pp. 122, 123.
[4] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1865, p. 167.

an opinion on the subject, to adopt the plan followed by Claparède, Grube, and Ehlers in this case. Thus the distal region of the proboscis is termed the maxillary ring, the next the basal. The first (I.) series of paragnathi is the median dorsal at the base of the maxillæ; II. indicates the group on each side of the foregoing; III. the median ventral at the base of the maxillæ; IV. the lateral series adjoining the last; V. the median dorsal series of the basal ring of the proboscis; VI. the lateral series on each side of the foregoing; VII. and VIII. the remaining lateral and ventral paragnathi of the same ring, generally disposed in a more or less continuous series. Too much reliance, however, should not be placed on the paragnathi, as we are not yet fully acquainted with their sexual and other variations.

The Nereidæ often secrete somewhat hyaline tubes in which they dwell, or burrow in muddy sand under stones like *Nereis cultrifera*, Grube. Some again frequent crevices in rocks, the stems of decaying tangles, or sponges, as in the *Nereis hircinicola* of Eisig.

Nereis, Linnæus.

Nereis (*Platynereis*) *kobiensis*, n. sp. (Pl. XXXIV. figs. 3, 4, 5, 6; Pl. XVIA. figs. 2, 3, 4).

Habitat.—Dredged at Station 233A (near Kobé, on the west coast of Japan), May 19, 1875; lat. 34° 38′ N., long. 135° 1′ E.; depth, 50 fathoms; surface temperature, 62°·6; sea-bottom, sand.

Head somewhat longer than broad; tentacles about the length of the head. Palpi large, the tips of the bosses scarcely reaching those of the tentacles. Eyes large and furnished with lenses. Tentacular cirri attenuate, the longest reaching to the fourteenth or fifteenth segment. Paragnathi of proboscis—I. and II. absent; III. irregular transverse series; IV. in triangular groups, the points being larger than in III.; V. absent; VI. double transverse rows; VII. and VIII. in tolerably continuous curved rows. Maxillæ pale brown, with eight teeth besides the fang. The first segment of the body longer than the second, and with a peak directed forward in front. From the fifth to the eleventh the feet have blunt lobes. The latter become larger posteriorly.

The specimens are fragmentary, the longer measuring about 50 mm. and about 4·5 mm. in breadth anteriorly.

The body presents no coloration dorsally, the only pigment present being that in the glandular masses ("Spinndrüsen," Ehlers) at the bases of the feet.

The tentacles are about the length of the head (Pl. XXXIV. fig. 3), which bears a general resemblance to that of *Nereis dumerilii*, Aud. and Ed., as also do the palpi and long tentacular cirri. The eyes are large, and situated in proximity on each side, but they do not touch. The anterior pair are somewhat larger, and as the lens is placed at the anterior and outer margin, their appearance diverges from that of the

posterior pair, and they are better fitted for looking forward and outward. Each is slightly crescentic in outline. The posterior pair have the lens in the centre superiorly, and therefore look upward. The maxillæ possess about eight teeth, besides the terminal fang. The paragnathi differ from those in *Nereis dumerilii;* group VII. and VIII. of the basal or oral ring in extrusion being formed by a tolerably continuous minute series in a curved granular row in each lozenge. The lateral dorsal series (VI.) of the same ring has the form of a double transverse row on each side. The series (IV.) at the base of the maxillæ inferiorly form two somewhat triangular lateral groups and a median one (III.) of smaller points. All these possess comparatively larger horny points than in *Nereis dumerilii*, and a different aspect, though neither of the examples is favourable for minute description in this respect.

The feet somewhat resemble those in *Nereis dumerilii*, with the exception that those with the rounded lobes stretch from the fifth to the eleventh. The tenth foot (Pl. XXXIV. fig. 4) presents three prominent rounded lobes, the superior being more oblique in its outline ventrally than dorsally. The superior cirrus is rather more than three-fourths the vertical diameter of the foot, and stretches considerably beyond the upper lobe, while the ventral does not reach the tip of the lower lobe. The dorsal tuft is composed of a series of the ordinary bristles with comparatively short and boldly serrated tips (Pl. XVIA. fig. 2), and a single deep amber-coloured and characteristic hook (Pl. XVIA. fig. 3). The inferior division bears above the spine a series of bristles similar to those already described, and below it a group of falcate bristles, a few of the upper (Pl. XVIA. fig. 4) being larger than the others.

As usual the tips of the spines are black, the superior touching the base of the peculiar hook, and the inferior surmounting the falcate bristles.

The thirty-seventh foot (Pl. XXXIV. fig. 5) still exhibits three prominent lobes, but all are more slender and elongate than in front. At the base of the dorsal cirrus are two pigment-patches, and a third exists on the body at the origin of the foot. The superior lobe is somewhat conical in lateral views, while the middle and inferior approach a lanceolate form. These characters are slightly varied in the fifty-seventh foot, for whilst the superior and inferior lobes are longer, the middle is proportionally less. Two hooks, moreover, occur above the superior spine, and their elongate shafts project a considerable extent beyond the cuticle.

The special hooks in the superior division of the foot would appear to be related to the habits of the Annelid. A hyaline but somewhat tough tube occurred with it, and in all probability, like *Nereis dumerilii* and others, it inhabits this, and uses its hooks for fixing itself, either when withdrawn or during partial projection. The only other form (known to me) which presents a similar arrangement in the upper division of the foot is *Nereis agassizi* of Ehlers.[1]

[1] Die Borstenwürmer, Bd. ii. p. 542, Taf. xxiii. fig. 1.

Fragments of Crustacea, Confervæ, Diatoms, and other debris occurred in the intestine.

In the structure of the body-wall this form approaches *Nereis diversicolor*, O. F. Müller, rather than *Nereis pelagica*, Linn., especially in the fold of the ventral muscles and in the position of the nerve-cords. The vertical muscles seem to be largely developed. No neural canals are visible, but the specimen is too much softened for minute examination. The perivisceral cavity is loaded with the debris of cells and granules.

Nereis (*Platynereis*) *tongatabuensis*, n. sp. (Pl. XXXIV. figs. 7, 8, 9; Pl. XVIA. figs, 5, 6, 7).

Habitat.—Dredged at Station 172 (off Nukalofa, Tongatabu), July 22, 1874; lat. 20° 58′ S., long. 175° 9′ W.; surface temperature, 75°·0; depth, 18 fathoms. On the mud of a coral reef.

Head very slightly longer than broad, mottled with pigment; tentacles longer than the head; eyes larger than in the former, and all with lenses. Palpi large, mottled with pigment. Tentacular cirri very long, the longest reaching to the fourteenth segment. Paragnathi of proboscis minute—I. and II. absent; III. absent or indistinct; IV. angular patches of very minute points; V. absent; VI. rows of minute points in single series; VII. and VIII. form a series of bars of very minute points. The maxillæ are deep brownish at the tip, straw-coloured at the base. The first segment is longer than the next. Both anterior and posterior feet have longer lobes than *Nereis kobiensis*. The anterior dorsal cirri are also longer. Dorsal bristles spinose as in the former; no other form present in the example. The upper series of the inferior bristles have long spinose, the inferior short falcate tips.

The specimen measures about 33 mm. in length, and at its broadest part in front is about 2·5 mm. in diameter.

The body is widest in front, just behind the head, and gradually diminishes towards the posterior end, which, however, is incomplete. Like *Nereis dumerilii* the feet have two pigment-patches, and a smaller exists on the body at their base. Moreover, a distinct line of pigment passes from side to side at the latter, the band thus crossing the segment nearer its anterior than its posterior border. The dorsum is prominently rounded in front from the included proboscis, but has a slight groove throughout the rest of its extent. A much more decided median groove occurs, from head to tail, ventrally. The number of segments in imperfect examples is of little moment.

The head (Pl. XXXIV. fig. 7) is longer than broad, and about the length of the antero-posterior diameter of the first two segments. The tentacles are comparatively long, exceeding the diameter of the head, and the tip is filiform. The palpi present the usual shape. There are four large eyes, the anterior pair exceeding the others in size, and having the lens at the outer and anterior margin. There is also a minute and indistinct

lens in the centre of the posterior pair. The tentacular cirri are very long, the long posterior pair reaching to the fourteenth bristled segment. A few pigment-patches occur on the head and palpi.

The buccal segment is narrow, agreeing in this respect with the succeeding one. The proboscis is withdrawn. The paragnathi (VII. and VIII.) of the buccal basal ring are in the form of a single interrupted series of very minute points, each separate bar appearing as a continuous streak under the lens. When more highly magnified these bars are seen to consist of a compact series of minute points. The lateral dorsal paragnathi (VI.) of the same ring form a short row of minute points in single series. Near the bases of the maxillæ they constitute on each side an angular patch (IV.) composed of interrupted rows of the same very minute points. The median seem to be absent. The maxillæ are translucent straw-yellow at the base, deep brown at the tip and edges, and have seven teeth of fair size beneath the great fang.

The first foot is prominent, consisting of three long conical lobes, with pigment, and a dorsal and ventral cirrus. The second is similar, while the third shows a better developed setigerous division above the lower lobe. The fourth has its lobes rounded, a condition which is gradationally increased from the first to the fourth. The fifth, sixth, seventh, eighth, and ninth present large rounded lobes, especially inferiorly, but this character is less marked in the tenth, a feature which forms a contrast with the condition in *Nereis dumerilii*. Superiorly the tenth foot (Pl. XXXIV. fig. 8) has a somewhat pointed lobe with an elevation at the base, from which the dorsal cirrus projects. The latter is longer than the vertical diameter of the foot. The dorsal fascicle consists of bristles (Pl. XVIA. fig. 5) similar to those in the previous species. The peculiar falcate forms have probably fallen out. The middle lobe of the foot is somewhat ovate, with a notch superiorly, and it extends almost as far outward as the superior. The inferior setigerous process is of considerable length, and bears superiorly a group of the spinose bristles and inferiorly a series with short falcate processes. The inferior lobe is pedate, and does not reach a line from the tip of the setigerous region above. The ventral cirrus arises from a prominent rounded boss, and is somewhat shorter than the inferior lobe.

At the thirty-seventh foot (Pl. XXXIV. fig. 9) a considerable change occurs. The dorsal cirrus is shorter, being less than the vertical diameter of the foot, while the elevation from which it springs is more marked, and the two pigment-masses larger. The superior lobe is also more acute. The bristles beneath the superior setose forms are elongate, and have a guard or wing attached to the tip of the falcate region (Pl. XVIA. fig. 6), which is set into the end of the shaft in a peculiar manner, and there is a rounded body like a little bursa or cushion at the base between the articular surfaces. These bristles are somewhat strong, their shafts being about twice the diameter of the setose forms. The next lobe of the foot is about the same length, but its tip is rather

broader. A considerable hiatus then exists between it and the inferior setigerous lobe, which has, besides the setose, simple falcate bristles with a slight guard at the tip (Pl. XVIA. fig. 7). The inferior lobe is elongate, and nearly of uniform diameter till near the tip. The ventral cirrus is shorter than a vertical line falling from the latter. There is thus a primary division of the foot into two superior and two inferior processes.

At the fifty-seventh foot the superior lobe and its basal process are very large. The latter is occupied by the two great and closely approximated pigment-masses. The dorsal cirrus again becomes longer than the vertical diameter of the foot. The latter still shows the two primary divisions, and the bristles do not require special mention.

A small hyaline sheath occurs in the bottle, and the species is in all probability a tube-dweller.

Much of the intestine is empty, but posteriorly a quantity of soft greyish debris is present. Only fine granules and sand-grains are visible in the latter.

The arrangement of the paragnathi resembles that characteristic of Kinberg's *Pseudonereis*,[1] so far as can be gathered from the description, but neither his *Perinereis gallapagensis* from the Gallapagos Islands, nor his *Perinereis formosa* from the littoral corals of Honolulu, approaches the foregoing. The present species would seem rather to come under *Platynereis*.

The cutaneous elements are largely developed ventrally in this form, and the nerve-cords are situated close to the surface in the median line, that is, have no pedicle. The ventral longitudinal muscles are somewhat ovoid in transverse section, the external superior fold passing far inward. A peculiar streaked granular area lies on each side of the vessel above the nerve-cord, but the exact nature of this tissue is doubtful. It may represent the male reproductive elements. The glandular lining of the alimentary canal is largely developed in this species.

Nereis (*Platynereis*) *arafurensis*, n. sp. (Pl. XXXIV. figs. 10, 11, 13).

Habitat.—Dredged in the Arafura Sea.

Head nearly as long as broad; tentacles rather larger than the head; eyes large and furnished with lenses. Palpi shorter than in *Nereis dumerilii*. Tentacular cirri absent. Paragnathi of proboscis—I., II., and III. absent; IV. indistinctly angular groups of minute points; V. absent; VI. somewhat ovoid groups of similar points; VII. and VIII. short and indistinctly double rows. Maxillæ straw-coloured at the base, with a narrow band of deep brown along the cutting edge and tip; five or six teeth below the fang. First segment broader than the succeeding, with a median nuchal angle directed

[1] *Op. cit.*, p. 174.

forward. The upper lobe of the foot rather longer than in the previous form, and the dorsal cirrus somewhat shorter; otherwise both bristles and lobes nearly correspond.

A fragmentary example of about forty-six segments of the anterior region, and measuring 20 mm. in length and 4·5 mm. in breadth anteriorly.

The head is nearly as long as broad, and is furnished with four large eyes, the anterior pair being slightly lateral in position, with the lenses directed outward. They are very little larger than the posterior pair, which also have their lenses somewhat external, though, when viewed from the dorsum, a ring of black pigment is seen all round. The tentacles are fully the length of the head, and finely tapered at the tip. The palpi are rather shorter than in *Nereis dumerilii*, and their terminal boss smaller. The long cirri are absent, but judging from the other forms present they would seem to have been very long, probably as long as in *Nereis tongatabuensis*.

The buccal segment is slightly pointed forward in the middle line dorsally, and is about the breadth of the succeeding (both being narrow). The proboscis is withdrawn. On the dorsal surface of each elevation of the basal (buccal) region of the latter is an irregular group (VI.) of small points visible under a lens, and there are single rows of more minute ones (VII. and VIII.) on some of the other folds of the same region. The paragnathi (IV.), again, at the base of the maxillæ, form an indistinct, angular group of minute points on each side, and much less regular than in *Nereis tongatabuensis*. The maxillæ are of a translucent straw colour, with a comparatively small belt of deep brown along the functional edge and tip, and the denticulated region is short. The tip of each organ is short and broad, and beneath are five or six small and rather acute teeth, which follow the terminal fang without a break.

The first four feet are less bulky than the fifth, and they present a general agreement with those of the preceding form. Large rounded lobes occur from the fifth to the ninth. The tenth foot (Pl. XXXIV. fig. 11) has a shorter dorsal cirrus than in the species just mentioned, and the superior bristles have longer spinose tips. The processes of the foot also differ, the ventral lobe especially being rounded and more obtuse. The ventral cirrus is shorter.

At the thirty-seventh foot (Pl. XXXIV. fig. 13) the superior lobe is less elevated superiorly, and the dorsal cirrus shorter. The next lobe and the inferior setigerous division are similar. The inferior lobe also corresponds, but the ventral cirrus is shorter than in the previous form. In regard to the bristles, those of the superior division have longer tips, but the falcate appear to be the same, though no specimen is perfect.

In the intestine are masses composed of pale greenish fragments of Algæ, Confervæ, and a few Diatoms.

This form is closely related to *Nereis tongatabuensis*. It also comes near the *Platynereis jucunda* of Kinberg from Honolulu.[1] Grube's *Nereis* (*Platynereis*) *fusco-*

[1] Annulata Nova, *op. cit.*, p. 177.

rubida, from the Philippines,[1] is likewise an allied species, from which it is distinguished by the absence of paragnathi III. and other points.

Nereis (*Lycoris* ?) *pelagica*, Linnæus.

Habitat.—Dredged at Station 49 (south of Halifax, Nova Scotia), May 20, 1873; lat. 43° 3′ N., long. 63° 39′ W.; depth, 85 fathoms; bottom temperature 35°·0, surface temperature 40°·5; sea-bottom, gravel and stones. The specimens procured at this Station resembled those from the Gulf of St. Lawrence, Canada.

A single example of average size, measuring (without the absent tail) about 85 mm.

An albino-patch occurs between and behind the eyes. The chief difference between this and a form of the same size from St. Andrews is the decided diminution of the superior lobe in the specimen from the Challenger, a feature in which the latter agrees with the Canadian examples. Considerable latitude apparently requires to be given to this species. Thus in the Canadian and other varieties the pit for the dorsal cirrus is rendered deeper by the increase in the shoulder behind it. Some of these varieties are probably sexual.

The intestine of the specimen is loaded with muddy sand, mixed with organic debris and sponge-spicules.

This species possesses a very wide geographical range, not only frequenting the northern shores of Europe and America, but passing considerably southward to the Canaries and West Indies. It also extends eastward to Japan.

Nereis (*Perinereis*) *melanocephala*, n. sp. (Pl. XXXIV. figs. 14, 15, 16, 17; Pl. XVIa. figs. 8, 9).

Habitat.—A single example found between tide-marks at Bermuda, June 1873.

The body somewhat resembles a very dark *Nereis marionii*. Head longer than broad; tentacles little more than half the length of the head; eyes of moderate size, each with a small lens. Palpi large and dark, tips pale. Tentacular cirri short, the longest just reaching the fourth segment. Paragnathi—I. form a triangular area of somewhat large flattened teeth; II. rhomboidal patches of teeth of the same size; III. larger area than I.; IV. similar to II.; V. a single large black tooth; VI. continuous broad horny bands; VII. and VIII. broad belt of large isolated teeth. Maxillæ blackish-brown, with six or seven teeth below the fang. First body-segment twice the breadth of the succeeding. Lobes of the feet, blunt in front, but posteriorly the dorsal is greatly enlarged

[1] Annelidenfauna d. Philippinen, p. 70.

and elongated. Dorsal cirrus short. Superior bristles with long delicate setose tips; lower ventral falcate.

The length of the specimen is about 38 mm., and its breadth at the widest region 4 mm.

The dorsum is deep brownish anteriorly, with a purplish iridescence, gradually fading into dull brownish at the commencement of the middle third, and becoming lighter as we proceed backward, while the pigment also gradually leaves the sides of the body and occupies the middle line. On the ventral surface the buccal and a few of the anterior segments are dusky; the rest are pale.

The head (Pl. XXXIV. fig. 14) is of a deep brownish-black hue and iridescent, the pigment being so developed that the eyes are at first sight invisible. At each side is a somewhat triangular pale patch, which gives the blackish dorsal area a definite spade-like shape. The posterior projection (of the dark pigment) has anteriorly an eye of average size, with the lens directed outward. Straight behind the foregoing on each side is another eye having a small lens nearly in the centre. The tentacles are considerably shorter than the head, the basal half being dark brown, the distal pale. The tentacular and other cirri are all pale and short, the longest reaching only to the commencement of the third bristled segment. The palpi are of considerable size, brownish-olive dorsally, with pale terminal bosses.

The first body, or buccal, segment is somewhat broad, indeed is about twice the breadth of the succeeding. On the ventral suface the olive-brown pigment is marked by pale dots, and these are also present on the under surface of the palpi and in each segment of the body. In the latter case these pores or specks form a row across the segment, about the anterior third, and are best seen anteriorly where the pigment is deepest. The paragnathi (VI.) of the basal ring of the proboscis constitute a continuous broad band (not isolated teeth) which runs transversely across each of the dorsal elevations of the organ in front of the palpi; and in the middle line between them is a single large black tooth (V.). The basal series (VII. and VIII.) on each side consists of a broad belt of isolated and well-marked teeth, somewhat less than those of *Nereis cultrifera*, Grube. In the artificially extruded proboscis three series occur dorsally, viz., a triangular median area (I.) of teeth (mostly flattened), somewhat less than those forming the basal ring; and a lateral rhomboidal patch (II.) of similarly flattened teeth of the same size on each side. Three similar patches of teeth (III. and IV.) occur on corresponding parts on the ventral surface, but the central (III.) is larger. All the teeth present the effects of attrition. The maxillæ are dark brown from the tip almost to the base of the exposed part. If examined from the end, the tip as usual is seen to be bevelled on the dorsal edge. The dental margin of each maxilla seems to have been much worn, but in one six or seven points can be made out.

There is no special differentiation in the anterior feet, which at the tenth

(Pl. XXXIV. fig. 15) have a very short dorsal cirrus arising from a shoulder at the base of the superior lobe, and which extends slightly beyond the tip of the latter. The next lobe is blunt, and scarcely reaches as far outward as the tip of the superior. The inferior setigerous division as usual is bifid, and the tip projects beyond the neighbouring lobes. The inferior lobe is large and obtuse distally. The superior bristles have a long delicate and finely setose tip (Pl. XVIA. fig. 8); and the structure of those in the superior groups of the ventral series is similar. The bristles of the inferior ventral group have peculiar falcate tips (Pl. XVIA. fig. 9), for a slight convexity in the anterior curve of the tip gives it less a hook- than a knife-like edge. The margin below the latter is setose. The ventral cirris is short, reaching only to the terminal third of the inferior lobe. The spines of the feet are black.

At the thirty-seventh foot (Pl. XXXIV. fig. 16) the superior lobe, from its upper to its lower portion, embraces about half the foot in vertical space, and it is separated by a considerable interval from the next region. The dorsal cirrus is still short, reaching only a little beyond the tip of the lobe. The latter is in the form of a long cone. The second lobe does not project so far, and is bluntly lanceolate. The setigerous lobe beneath is shorter than the latter, but yet large. The inferior lamella, again, is more slender than the second, and just reaches the tip of the setigerous division. The ventral cirrus has about the same proportions as in the tenth foot. Five or six glandular pigment-masses are present in the greatly increased superior lobe, and just beneath the cuticle at their outer ends are several rounded oil-like globules.

The tendency to the enlargement of the superior lobe goes on till at the fifty-seventh foot a process homologous with that in *Nereis marionii*, Aud. and Ed., is formed. This consists of a broad lamella stretching upward and outward from the foot and bearing the dorsal cirrus near its tip, while the superior lobe proper forms a lanceolate terminal process. The dorsal cirrus has about the same proportional length as in front. Along the upper region of the great basal process are numerous separate glandular pigment-masses. The middle, inferior setigerous, and lower lobes are less than in the thirty-seventh foot, but they preserve to a great extent the same relative proportions.

The elongation of the superior process goes on to the posterior end of the animal, so that at the sixty-seventh foot (Pl. XXXIV. fig. 17) the length of the lobe is greater than the vertical diameter of the foot (from the base of the upper lobe to the ventral cirrus). The bristles and other parts, however, do not differ in any noteworthy manner.

The intestine of the specimen showed no definite contents.

The cuticle is comparatively thin, and with the narrow hypoderm forms an attenuate but firm investment to the body. The circular muscular layer is distinct, though also thin. The nerve cord lies close above the junction of the oblique muscles. The outer superior fold of the longitudinal ventral muscles is moderately developed. The dark pigment is chiefly situated in the hypodermic layer.

This species quite differs from *Nereis marionii* in regard to the tentacles, the tentacular cirri, and the paragnathi. It is also distinguished from *Nereis limbata*, Ehlers,[1] from the east coast of North America, by the paragnathi. It more nearly approaches the *Nereis succinea* of R. Leuckart, from the North Sea (Heligoland, Cuxhaven, &c.), but its paragnathi also deviate. Thus, instead of the structure given above, I. in *Nereis succinea* has three arranged antero-posteriorly; II. forms a double row, and so with the others. In the same manner it is separated from *Nereis vexillosa*, Grube,[2] from the west coast of North America. All these forms, however, belong to the same group.

Nereis atlantica, n. sp. (Pl. XXXV. figs. 1, 2, 3; Pl. XVIA. figs. 10, 11).

Habitat.—A single example was procured at St. Vincent, Cape Verde Islands, July 1873.

Head about the same length as breadth; tentacles only about half the length. Eyes large, the pairs almost touching on each side, all with lenses. Tentacular cirri comparatively short, the longest reaching the fifth segment. Paragnathi—I. a single large tooth; II. each with five to seven teeth; III. a central and about eight surrounding teeth; IV. groups twice the area of II.; V. two narrow, horny ridges, and behind one a small posterior tooth (in extrusion); VI. absent; VII. and VIII. in three ranks at considerable intervals. Maxillæ dark brown; four teeth below the fang. First segment broader than the next. Feet have conical lobes with truncated tips anteriorly. The second lobe increases characteristically posteriorly. Dorsal cirri short. Setose bristles with long slender extremities; falcate with a convex anterior (setose) margin along tip.

A form about 88 mm. in length and about 4·5 mm. in breadth at its widest part.

The body presents the ordinary appearance in front, but the posterior region is pale, from the development of the reproductive elements.

The head (Pl. XXXV. fig. 1) is somewhat triangular, with the apex truncated anteriorly; and its antero-posterior diameter is only slightly more than the transverse at the base posteriorly. The anterior part of the head is marked by minute pale points or pores. The tentacles are short and subulate, being little more than half the antero-posterior diameter of the head. The tentacular and other cirri are comparatively short, the longest reaching the fifth foot. The posterior half of the lateral cephalic margin is occupied by the pigment of the eyes, which almost touch each other. The anterior pair are decidedly larger, and have the elongated lens in the line of the margin, so that the eye looks forward and outward. The pigment is mostly on the dorsal side of the lens.

[1] Die Borstenwürmer, Bd. ii. p. 567.

[2] Reise ü. Norde und Oste Siberiens, *Mém. Inst. Savans Étrang. St. Petersb.*, 1858, Sep. Abd. p. 4, pl. ii. figs. 1, 5, 6.

only a narrow line occurring along the ventral border. The posterior pair lie immediately behind the foregoing, and have the much smaller and somewhat ovoid lens directed outward and backward, the great mass of the pigment being anterior and internal, though a much broader margin of pigment occurs externally than in the case of the anterior pair. The palpi are of average size.

The buccal segment is somewhat broader than the succeeding, and has the anterior margin on the dorsum only very slightly curved forward. The basal region of the proboscis shows dorsally a single prominent elevation bearing a pair of large brown teeth (V.), and a smaller one below them (in extrusion). The basal circular series (VII. and VIII.) is in three ranks, a considerable interval on each side occurring between it and the former. When the proboscis is extruded these form a sparsely armed region, the larger teeth being distal and the smaller proximal. On the dorsal surface of the maxillary ring, at the base of the maxillæ, are three groups—a median (I.) consisting of a single rather large tooth, and a small group (II.) on each side of from five to seven teeth, all of which (with the exception of the first) are smaller than those of the basal series of three rows. Three groups occur inferiorly in the same region, a median (III.), consisting of a central and eight surrounding teeth, and two lateral (IV.) each more than twice the size of the superior groups. The maxillæ are dark brown from the tip almost to the base, and in the only one available for examination four teeth are present below the terminal fang.

There is no marked change in regard to the structure of the foot in front. The tenth foot (Pl. XXXV. fig. 2) presents dorsally a slightly arched base, from the outer slope of which a rather short dorsal cirrus proceeds. About a fourth of it extends beyond the tip of the dorsal lobe. The latter is broad at the base, has a somewhat regular incurvation on its superior and inferior margins, and ends in a peculiarly truncated tip. The next region has a similar extremity, but its base is convex inferiorly. It extends outward nearly as far as the superior lobe. The inferior setigerous division is considerably produced, and has a well-marked terminal process on each side. The inferior lobe is large, similar to the second in shape, and reaches nearly as far outward as the setigerous division. The ventral cirrus extends little further than the middle of this lobe. The superior bristles are setose, and the inferior setose and falcate.

At the thirty-seventh foot an elevated process occurs internal to the base of the dorsal cirrus, which hardly reaches the tip of the elongated and somewhat conical dorsal lobe. The second region is gibbous at the base, and extends fully as far outward as the first. The inferior setigerous division is long, though the great increase in the two upper render this feature less conspicuous. A well-marked collar exists a little within the terminal papillæ. The ventral lobe is also very long and lanceolate. The ventral cirrus has the same proportional length, but now springs from an elevated process which bulges beyond its base dorsally and ventrally.

The fifty-seventh foot (Pl. XXXV. fig. 3) shows greater differentiation, for the elevation at the base of the cirrus appears to form a part of the superior lobe. The dorsal cirrus scarcely reaches the tip of the latter. The second lobe is proportionally larger and more gibbous beyond the constriction at the base. The inferior setigerous division is more elongate, and the collar (which assumes a button-shape in ordinary views) more prominent. The ventral lobe is somewhat less than in front; while the cirrus has slightly increased in length.

The setose bristles (Pl. XVIA. fig. 10) have long, slender, tapering tips. The falcate forms (Pl. XVIA. fig. 11) have simple hooked tips with setæ on the margin below.

The tail terminates in four elongate cirri, two on each side of the anus.

In the intestinal canal are numerous fragments of small Crustacea, and minute pieces of cinders.

The nerve-cord lies in the angle between the insertions of the oblique muscles, and shows three large neural canals, a superior and two lateral. The superior fold of the ventral longitudinal muscles is moderate.

This form appears to come under Kinberg's group *Perinereis*, B,[1] with three paragnathi in V., and under division β, where only a single tooth occurs in I., his example being *Perinereis hedenborgi*, from Alexandria. An essential divergence from *Perinereis*, however, is the absence of paragnathi VI. This species most nearly approaches the *Nereis floridana* of Ehlers, as found by Langerhans[2] along with *Nereis cultrifera*, Grube, under stones on sandy gravel between tide-marks at Madeira. It differs from this, however, in the comparative length of the tentacles, and in the absence of paragnathi VI., which in *Nereis floridana* form "eine grosse quer lineare," while the arrangement of the other groups also diverges. The general outline of the feet, however, as well as the structure of the bristles, show the close proximity, and further investigation may clear up the present ambiguity.

Nereis (*Platynereis*) *dumerilii*, Aud. and Ed., var.

Habitat.—Two small and imperfect specimens were procured at St. Vincent, Cape Verde Islands, July 1873.

These specimens bear a very close resemblance to *Nereis dumerilii*, Aud. and Ed., though the second lobe of the foot slightly differs, and the setose bristles show less distinct serrations. The falcate forms are apparently less hooked. The eyes are also larger. The paragnathi, however, seem to correspond with those in the typical form, which extends from Shetland and the Baltic to Madeira, where Prof. Langerhans says it is not uncommon.

[1] *Op. cit.*, p. 175.

[2] *Zeitschr. f. wiss. Zool.*, Bd. xxxiii. p. 289, Taf. xv. fig. 24, 1880.

Nereis longisetis, n. sp. (Pl. XXXV. fig. 4; Pl. XVIA. figs. 12, 13, 19).

Habitat.—Trawled at Station VI. (off the Strait of Gibraltar), January 30, 1873; lat. 36° 23′ N., long. 11° 18′ W.; depth, 1525 fathoms; bottom temperature 36°·0, surface temperature 58°·0; sea-bottom, Globigerina ooze.

Head longer than broad; tentacles about half the length. Anterior eyes dorsal in position, much larger than the posterior, and furnished with lenses. Paragnathi few and scattered. Maxillæ have about five teeth below the fang. Anterior feet with pointed lobes; the latter becoming much longer posteriorly. Bristles very large and long; the majority in the groups have long dagger-shaped tips, but at the ventral edge these are much abbreviated. A few with shorter tips, intermediate in structure between the long dagger-shaped and falcate bristles.

A fragmentary and injured example, measuring about 10 mm., and having a total breadth (across the bristles) of nearly 3 mm.

The head (Pl. XXXV. fig. 4) is longer than broad, with two very large and somewhat ovoid anterior eyes, apparently furnished with indistinct lenses; and two much smaller eyes behind. The latter have no trace of lenses, and the injured condition of the anterior pair renders their description doubtful. The tentacles are short and subulate, being about half the antero-posterior diameter of the head. The tentacular cirri are either injured or absent. The large size of the anterior eyes, their dorsal position, and the disproportion between them and the posterior pair, are the chief characteristics of the head.

The buccal segment is broader than the succeeding, and the first three bristled segments are broader than those which immediately follow. Unfortunately the proboscis is injured, and all that can be said about the paragnathi is that they are few and scattered.

The maxillary teeth are about five in number.

In most of the feet after the anterior third the second lobe is directed forward, a feature which gives the long posterior feet a resemblance to those in *Glycera*.

The dorsal cirrus of the tenth foot is slender and filiform, and somewhat shorter than the superior lobe. The second lobe is very large, broad at the base, and conical toward the tip, which extends much beyond the first. The setigerous (inferior) division is short. The ventral lobe is broadly conical, and points outward and downward. The ventral cirrus seems to be short. The shafts of the superior bristles (Pl. XVIA. fig. 12) are long, and the tips are of moderate length, and slightly spinous. The setose, inferior bristles are similar to the foregoing, while those corresponding to the falcate have a long, slightly bent, dagger-shaped process, as in *Hesione;* indeed such tips are the longest yet observed in the Nereidæ.

At the twenty-seventh foot the chief change is the great elongation of the second lobe, the spine passing out to a papilla which projects further than the superior lobe. Beyond is a pointed process nearly as large as the entire superior region, and it is this

which extends forward and gives the foot its characteristic appearance. The inferior setigerous division is likewise very long, the papilla for the spine stretching nearly as far as the tip of the second lobe. The ventral lobe is elongated and pointed, and about the size of the superior lobe. The ventral cirrus is absent or injured. Two glandular pigment-patches occur at the base of the dorsal cirrus.

The superior bristles have comparatively short tips, and very fine serrations. The superior series of the inferior division have much elongated and finely tapered tips; then there are a few falcate forms with rather long, terminal pieces, and rounded tips (Pl. XVIA. fig. 19). Below the latter are some setose bristles with shorter tips than the superior series; while inferiorly are some of the forms with the extremities (Pl. XVIA. fig. 13) peculiar to the species, and which resemble reduced setose bristles. One or two, however, show the blunt tip, and there are some which do not have the bases proportionally broader than the long setose kind.

This species does not appear to have any connection with a *Heteronereis* or an epitocous condition, for the bristles resemble those of a perfect form. In the marked change which ensues between the anterior and posterior feet it approaches such as *Nereilepas* and *Alitta*. It further coincides with the latter type in having no truly falcate bristles, but it differs in the structure of the lobes of the feet, and in the absence of the slight hook at the tip of the shortest ventral bristles. Grube's *Nereis* (*Ceratonereis*) *similisetis*,[1] from Aibuhit, in the Philippines, perhaps comes nearest this form in the structure of the feet and bristles, for it has no falcate forms, and the tips are acute. The eyes are small in the Philippine species.

Nereis (*Platynereis*) *eatoni*, M'Intosh (Pl. XXXV. figs. 5, 6).

Nereis eatoni, M'I., Ann. and Mag. Nat. Hist., ser. 4, vol. xvii. p. 320, 1876.
Nereis (*Platynereis*) *eatoni*, M'I., Grube, Sitzungsb. d. k. preuss. Akad. d. Wiss. Berlin, August 1877, p. 522.
Nereis eatoni, M'I., Phil. Trans., vol. clxviii. (extra), p. 260, pl. xv. figs. 10–12, 1879.

Habitat.—Procured at various stations. A specimen without eyes, and considerably injured, occurred at Station 113A, September 1, 1873; anchorage off Fernando Noronha; lat. 3° 47′ S., long. 32° 24′ 30″ W. surface temperature, 78°·0; depth, 25 fathoms; sea-bottom, volcanic sand and gravel.

A fragmentary example was dredged, with a profusion of other forms, at Station 144A (off Marion Island), December 26, 1873; lat. 46° 48′ S., long. 37° 49′ 30″ W.; depth, 69 fathoms; surface temperature, 41°·0; sea-bottom, volcanic sand.

It also occurred at Station 149, off Kerguelen Island, January 9, 1874; lat. 49° 8′ S., long. 70° 12′ E.; depth, 20 fathoms; sea-bottom, volcanic mud.

A large specimen (9 mm. in diameter) was found off Port William, Falkland Islands, in 5 to 10 fathoms.

[1] Annel. Fauna d. Philippinen, p. 64, Taf. iv. fig. 4.

Head longer than broad; tentacles fully as long. Eyes of moderate size, devoid of lenses. Tentacular cirri much developed, the longest reaching the seventeenth foot. Paragnathi—I. and II. absent; III. present about five transverse rows of minute points; IV. each with about six oblique rows of similar teeth; V. absent; VI. each with three rows; VII. and VIII. form a series, each with two parallel transverse rows. Maxillæ brownish, with eight teeth below the fang. First segment longer than the next. Anterior feet with blunt lobes; posteriorly the dorsal lobe is thicker and less pointed than in *Nereis dumerilii*. The bristles as a whole have shorter tips than in the latter.

This form, which was first procured by the Rev. Mr. Eaton, of the Transit of Venus Expedition, seems to take the place of *Nereis dumerilii*, Aud. and Ed., of the European seas, and indeed it is allied in a very close manner to the latter species, and like it has no trace of the superior falcate bristles seen in *Nereis kobiensis* and *Nereis tongatabuensis*. When the proboscis in a large example is opened by longitudinal section from the ventral surface, long and somewhat interrupted rows (IV.) of paragnathi cover each elevation exterior to the maxillæ, and are more or less connected in the middle line ventrally (III.). If opened from the dorsum, a better view (since the organs are chiefly ventral in position) of the median connection is obtained. It consists of five or six long transverse rows. The median and two adjoining folds of the outer or buccal division have each two parallel transverse rows of similar small paragnathi (VII. and VIII.), the others are less distinct. One of the folds (the median) occasionally shows three rows. Two prominent dorsal elevations of the basal ring have each two complete rows of minute paragnathi and a smaller one. These probably correspond to series VI. The paragnathi would seem to be subject to considerable variation, and probably also, from their small size, to injury. The general appearance of the paragnathi from the ventral surface is shown in Pl. XXXV. fig. 6.

It feeds on olive *Fuci*, masses of which occur in the alimentary canal. Branching Algæ and Diatoms are also occasionally met with.

Nereis antillensis, n. sp. (Pl. XXXV. figs. 7, 8, 9; Pl. XVIA. figs. 14, 15, 16).

Habitat.—Procured off St. Thomas, West Indies.

Head somewhat longer than broad; tentacles fully the length of the head. Eyes large and with minute lenses. Tentacular cirri very long, the second longest reaching the fourteenth segment. Paragnathi—I., II., and III. absent; IV. a series of rows forming an angle on each side; V. absent; VI. each consisting of two parallel rows; VII. and VIII. series of parallel rows (two in each). Maxillæ pale straw-coloured at the base, brownish along dentary edge and tip; eight teeth below the fang. First segment broader than the next. Anterior feet have a smaller and more pointed dorsal

lobe than in *Nereis dumerilii*. Bristles have tapering dagger-shaped spinose and falcate tips.

A species closely resembling *Nereis dumerilii*, Aud. and Ed., and as it is fragmentary, a complete account is not obtainable. It is about the size of the species just mentioned.

The head is similar to that of *Nereis dumerilii* both as regards outline and tentacles. The posterior long tentacles are absent, but the next stretch to the fourteenth foot. The paragnathi (VII. and VIII.) of the basal ring are somewhat larger than in the former species, and arranged in well-marked parallel transverse rows, two on each fold. The superior lateral (VI.) of the same ring are likewise in two parallel rows. The maxillary paragnathi (IV.) are also individually larger, but have a similar arrangement to those in *Nereis dumerilii*. No intermediate points (III.) occur between them. The maxillæ exhibit about eight teeth.

The tenth foot (Pl. XXXV. fig. 8) has a more pointed superior lobe than in *Nereis dumerilii*, and the superior tuft has one or two falcate bristles inferiorly as in *Nereis kobiensis*, though none of the tips are present. The extremities of the setose forms are less distinctly serrated than in *Nereis dumerilii*. Inferiorly are the usual groups, none of the falcate kind having tips.

The two superior lobes in the twenty-sixth foot (Pl. XXXV. fig. 9) are somewhat smaller than in *Nereis dumerilii*, and the two falcate bristles in the superior group are present.

The superior bristles have rather long tips (Pl. XVIA. fig. 14), with a peculiar terminal curve and diminution. These tips are very finely setose. Posteriorly the falcate bristles of the superior group (Pl. XVIA. fig. 15) present a truncate tip. Those in the inferior division of the foot (Pl. XVIA. fig. 16) have a short terminal piece devoid of setæ, but as in the former case furnished with a guard or wing at the tip.

The intestine contains sandy mud, with a few sponge-spicules, bristles of Annelids, numerous fragments of Confervæ, and other debris.

The cuticular tissues are comparatively thin. The nerve-cords are somewhat flattened, and the median blood-vessel above them is largely dilated. The external fold of the ventral longitudinal muscles is large, passing inward beyond the median line. The perivisceral cavity contains cellular masses. The glandular wall of the alimentary canal is thick.

This form is very closely allied to *Nereis dumerilii* and *Nereis eatoni*, and further knowledge of the variation in regard to bristles may alter the view of its separation.

Nereis kerguelensis, Baird? (Pl. XXXV. figs. 10, 11, 12; Pl. XVIA. figs. 17, 18).

Habitat.—Dredged off Kerguelen, in 10 to 100 fathoms. A variety occurred at Station 149E, to the west of Cape Maclear, Kerguelen, January 21, 1874; depth, 30 fathoms; sea-bottom, volcanic mud.

Head about as long as broad; tentacles somewhat stout, considerably shorter than the head. Eyes rather large, widely separated transversely, but approaching each other antero-posteriorly; no trace of a lens. Palpi large, but the terminal boss is small. Tentacular cirri of moderate length, the longest reaching the ninth foot. Paragnathi—I. two points, or absent; II. triangular groups of small points; III. a small and somewhat irregular series; IV. larger triangular groups than II.; V. absent; VI. a single point in each; VII. and VIII. five single points, each in a lozenge. Maxillæ brown, five large teeth below the bare region at the fang. The first segment is very little broader than the succeeding. The feet anteriorly have more elongated processes than in *Nereis dumerilii*, while posteriorly they are less elongated. The cirri are shorter than in the latter species. Dorsal bristles have comparatively short tips; falcate bristles have somewhat elongated tips.

A fragment, consisting of forty segments of the anterior region, measuring 28 mm. in length, with a diameter at its widest part of about 5 mm. including the bristles.

The head (Pl. XXXV. fig. 10) is about as long as broad. The tentacles are rather stout, and considerably shorter than the head. The basal portions of the palpi are large, the terminal boss on the other hand being small. The longest tentacular cirrus reaches to the ninth foot, but the body is much contracted in front (the proboscis being extruded). The eyes on each side are wide apart, and of considerable size, the anterior pair being the larger. There is no trace of a lens.

The extruded proboscis exhibits dorsally a point (VI.) on each side of the basal (buccal) region in front of the palpi, and a somewhat triangular group of small paragnathi (II.) on each side of the base of the maxillæ. Ventrally there is a similar but larger group (IV.) corresponding to the latter, and in the centre a small series (III.), in a line drawn between the posterior borders of the lateral groups. The buccal (basal in extrusion) region has a single point of considerable size in each lozenge (formed by the wrinkles), in all five in number (VII. and VIII.). It is interesting that, though differing in number and in the outline of the spaces, these occur on the same sites as in *Nereis pelagica*, Linn. The maxillæ show five large teeth, a portion at the tip being bare.

In the variety from Cape Maclear the basal ring of the proboscis in extrusion shows dorsally a single point (VI.) in front of each palpus, a feebly developed double row (II.) near the base of the maxillæ, and two points (I.) between them. Ventrally there is a larger patch of paragnathi (IV.) at the bases of the maxillæ on each side, besides a somewhat scattered group (III.) in the centre. The basal collar (VII. and VIII.) has six points, five of them being very distinct.

The feet as a whole do not show any marked change of series. They have the glandular pigment-spots analogous to those of *Nereis dumerilii*. The tenth foot (Pl. XXXV. fig. 11) presents more elongated processes than in the latter species. Dorsally is a somewhat large tapering cirrus, which extends beyond the tip of the first

lobe. The latter is broadly triangular, the upper and lower edges being also convex. The second lobe is double, since an unusually large process occurs in front of the bristles. The larger division is somewhat ovoid, with a blunt tip, which scarcely reaches that of the superior lobe. The double setigerous lobe beneath extends quite as far outward as the foregoing. The inferior lobe is lanceolate, the point falling short of the setigerous region above. The ventral cirrus proceeds a little beyond the middle of the latter lobe. Superiorly the bristles are all setose, with comparatively short tips (Pl. XVIA. fig. 17). The very fine spikes or setæ on these are hardly seen under ordinary circumstances, except as a filmy margin. Similar bristles occur at the superior border of the inferior series. One or two falcate forms with elongated tips occur in the same group. The next division of the inferior series shows superiorly setose forms with shorter tips, and inferiorly a number of falcate bristles with long spinose tips (Pl. XVIA. fig. 18), some of which have an adnate wing just under the terminal hook.

At the thirty-seventh foot (Pl. XXXV. fig. 12) all the lobes have become more acute. The dorsal cirrus is more prominent, and extends about half its length beyond the superior lobe. The latter nearly forms an isosceles triangle. The second lobe has its accessory superior process much diminished (in comparison with the tenth foot); its inferior margin is convex at the base, its tip is pointed, and does not reach as far outward as the superior lobe. The setigerous lobes are massive, broad at the base and acute at the tip. The inferior lobe does not reach as far outward as the latter. The ventral cirrus passes along two thirds of the margin of the inferior lobe.

In the intestine is muddy debris containing long sponge-spicules, fragments of Radiolarians, a few Gregarinæ (parasitic), fragments of Algæ, often with groups of chlorophyll-granules, and many Diatoms.

The nerve-cords in this form are arranged somewhat like those of *Nereis pelagica*, Linn., viz., above the attachment of the oblique muscles, and connected with the hypoderm by a median pedicle. They have thus externally the attachment and decussation of the oblique muscles, the thin circular fibres, hypoderm and cuticle. The ventral longitudinal muscles have a comparatively small pennate fold superiorly and externally. The perivisceral cavity contains large granular ova in the larger example dredged off Kerguelen in 10 to 100 fathoms. In these and allied forms a series of vertical fibres are found between the oblique muscles, passing up on each side of the nerve-cord to the wall of the alimentary canal, the fibres partly keeping to the same side, and partly crossing to the opposite.

This appears to correspond with an imperfect specimen collected at Kerguelen by the "Antarctic" Expedition, and presented to the British Museum by the Admiralty, though no description by Dr. Baird has yet been found. It is allied to the *Nereis* (*Lycoris*) *masalacensis* of Grube[1] from Masalac in the Philippines.

[1] Annel. Fauna d. Philippinen, p. 75, Taf. v. fig. 4.

Nereis patagonica, n. sp. (Pl. XXXV. figs. 13, 14, 15; Pl. XVIIA. figs. 1, 2).

Habitat.—Trawled at Station 313 (at the eastern end of the Strait of Magellan), January 20, 1876; lat 52° 20′ S., long. 67° 39′ W.; depth, 55 fathoms; bottom temperature 47°·8, surface temperature 48°·2; sea-bottom, sand.

Head rather longer than broad, with two conspicuous pigment-belts running backward from the bases of the tentacles. The latter about two-thirds the length of the head. Palpi large, tentacular cirri of moderate length, the longest extending to the eighth foot in a young specimen. Paragnathi—I. and II. absent; III. a single small tooth; IV. absent; V. a single tooth; VI. absent; VII. and VIII. in single series, large and isolated. Maxillæ dark amber, a little deeper at edge and tip, eight to nine teeth below the fang. The first segment considerably broader than the next. Anterior feet with much larger lobes than in *Nereis dumerilii*, the ventral being especially developed. Superior bristles have rather short tips; falcate bristles have somewhat long tips, as in *Nereis kerguelensis*.

A large form belonging to the group containing *Nereis dumerilii*, and, like the others, living in a tube. The latter consists of a somewhat opaque tough secretion coated with coarse sand-grains, minute pebbles, and here and there small zoophytes and other organisms. The largest specimen measured about 60 mm., with a breadth of 6 mm. at its widest part.

In the preparation the dorsum is marked in front by two interrupted light brown bands, and these are subsequently followed by long patches arranged transversely on each side and rather in front of the middle of each segment. A similar patch occurs at the posterior margin of the somite, so that the dorsum has a characteristic appearance. The light brown bands in front are due to the same arrangement, only a belt of pigment (widening as it goes) is present from the patch backward to the segment-junction.

The head (Pl. XXXV. fig. 13) is rather longer than broad in front, with two conspicuous pigment-bands running backward from the base of the tentacles. The latter are pale, and about two-thirds the length of the head. They are not much tapered. The tentacular cirri are shorter than in *Nereis dumerilii*, the longest in a young specimen extending to the eighth foot, but only to the sixth in a large one, in which the tentacles are also shorter than the above estimate. The eyes are of moderate size (the anterior pair as usual exceeding the posterior), devoid of lenses in the small specimen, less distinct and slightly milky in the centre in the adult. The palpi have large bases and comparatively small terminal bosses.

The paragnathi (VII. and VIII.) of the basal ring are blackish, large, and arranged in a single series. They are seven in number, a median and three lateral, each in its

ventral lozenge. The double dorsal elevation of the same ring shows only a single tooth (V.), which is nearly, but not quite, median. A single minute central one (III.) occurs on the elevation between the maxillæ (when withdrawn). The inferior lateral maxillaries (IV.) are absent. The maxillæ have eight or nine teeth, the two distal being small. These characters are uniform in both large and small examples.

The tenth foot (Pl. XXXV. fig. 14) has much larger lobes than in *Nereis dumerilii*. From the outer slope of a prominent elevation at the base of, and as long as, the superior lobe, a dorsal cirrus arises and extends outward considerably beyond the tip of the region. The latter is regularly lancet-shaped, with a distinct constriction at the base. The second lobe, which has a small accessory one at its base, is ovato-lanceolate, and does not reach so far outward as the first. The inferior setigerous lobe is comparatively short, and its free margin slopes from above downward and inward. Its tip scarcely reaches the middle of the second region. The ventral lobe is greatly developed, forming a large ovoid process, in this respect therefore being in marked contrast with the corresponding part in *Nereis kerguelensis*. This lobe does not extend so far outward as the setigerous division above it, for the middle region of the foot, consisting of the second and third lobes, is much produced. The ventral cirrus arises from the margin at the base of the ventral lobe, and has only a slight elevation beyond the basal constriction. It extends two-thirds the length of the ventral lobe.

The superior setose bristles (Pl. XVIIa. fig. 1, from the middle of the series) have somewhat short tips. The falcate forms again (Pl. XVIIa. fig. 2) show a distinct though rudimentary wing at the extremity, and the spines on the margin are long.

The thirty-seventh foot presents a general extension of all the lobes (Pl. XXXV. fig. 15), the superior, second, and ventral especially forming elongated processes. The latter is now much longer than the setigerous division immediately above it. The ordinary setose bristles occur superiorly, while the falcate series in the inferior group are very strong.

Two flat ovoid papillæ, as usual, are placed below the anus, in the middle line above the bases of the caudal cirri.

The relation of the large specimens of Dr. Baird's *Nereis magellanica*, from the Strait of Magellan,[1] presented by the Admiralty, is difficult to determine on account of the softened condition of the specimens, but in regard to the eyes, structure of the feet and bristles (which have shorter tips), it appears to differ. This is confirmed by an examination of a smaller form, somewhat less softened.

A species in the British Museum, collected by Dr. R. O. Cunningham in Peckell's Harbour and Gregory Bay, differs from the foregoing in the structure of the eyes, feet, and bristles. It is probably undescribed.

[1] British Museum (59, 10, 28, 26).

Nereis (*Ceratonereis*) *brasiliensis*, n. sp. (Pl. XXXVI. figs. 1, 2, 3; Pl. XVIIA. figs. 3, 4).

Habitat.—Trawled at Station 122B (off Barra Grande, Brazil), September 10, 1873; lat. 9° 9′ S., long. 34° 53′ W.; depth, 32 fathoms; surface temperature, 77°·5; sea-bottom, red mud.

Head nearly as long as broad; tentacles about two-thirds the length of the head. Eyes of moderate size, devoid of lenses. Tentacular cirri short, the longest scarcely reaching the third segment. Paragnathi—I. absent; II. double rows of large points; III. two teeth; IV. ovoid patches of large points; V. to VIII. absent, the basal ring of the proboscis being devoid of paragnathi. Brownish maxillæ have four to five teeth below the fang. The first segment is decidedly broader than the next. Feet have rather long conical lobes. The superior bristles have comparatively short tips; the falcate forms have somewhat elongated extremities, often with a convex spinose margin.

A small *Nereis*, about 34 mm. in length and 3·5 mm. in breadth at its widest region. There is nothing very characteristic in the external appearance of the form, except perhaps the short tentacular and other cirri, and the coloured glandular masses on the posterior feet.

The head (Pl. XXXVI. fig. 1) is nearly as long as broad. The slightly tapered tentacles are about two-thirds the length of the head. The tentacular and other cirri are short, the longest scarcely reaching the third body-segment. The four large eyes are devoid of lenses, and occupy the lateral margin posteriorly.

The buccal segment is slightly longer (*i.e.*, in antero-posterior diameter) than the next. The buccal region of the proboscis has no paragnathi. Two black paragnathi (III.), one in front of the other, occur on the ventral median lozenge between the maxillæ. On the elevation close to the inner side of each maxilla is an ovoid patch (IV.) of about a dozen distinct blackish paragnathi. On the dorsal arch of the proboscis, after withdrawal, are two elongated rows of eight or nine well-marked blackish points (II.). They are so arranged as nearly to form a double row in each group. There are none in the middle maxillary region superiorly; and the basal ring of the organ is entirely devoid of them. The brown maxillæ have respectively four and five teeth below the tip. The region of the alimentary canal immediately succeeding the proboscis has its internal surface covered with unusually distinct conical glandular papillæ.

The tenth foot (Pl. XXXVI. fig. 2) has a dorsal cirrus considerably longer than the superior lobe, which nearly forms an isosceles triangle. The second lobe shows a rounded accessory one at its base, and is bluntly triangular, with a long inferior and a short superior margin. Its tip projects nearly as far outward as that of the superior lobe. The inferior setigerous division is less prominent than the foregoing. The ventral is somewhat

lanceolate, and its tip is rather within the line of the former. The ventral cirrus extends about three-fourths the length of the inferior margin of the ventral lobe.

At the thirty-seventh foot (Pl. XXXVI. fig. 3) all the lobes are more elongated, more slender, and more acute, except the inferior setigerous, which is considerably larger than in front. The tips of the inferior bristles of the superior lobe are absent, but judging from the size of the shafts they are probably falcate.

The most marked change in the fifty-fourth foot is the increase in the superior lobe, especially at its base, where the glandular masses are. It also projects further outward than in front.

The setose dorsal bristles (the "arêtes homogomphes" of Claparède) have somewhat short tips (Pl. XVIIa. fig. 3). The transverse markings in the centre of the shaft are broken up in a curious manner, so that they have a coarse appearance. The tips of the falcate bristles (Pl. XVIIa. fig. 4) have a slightly convex anterior margin. They are the "serpes hétérogomphes" of Claparède.

The intestine is filled with dark brownish masses containing triradiate and other sponge-spicules and a few Diatoms.

This species comes near *Nereis kerguelensis*. The lobes of the feet, however, are longer. It closely agrees with its allies in the structure of the bristles, except in the incomplete condition of the transverse bars in the centre of the shaft. The paragnathi also diverge from those of other forms, and their absence from the basal ring places it in Kinberg's genus *Ceratonereis*. It approaches especially *Ceratonereis mirabilis* and *Ceratonereis vulgata*, Kinberg,[1] both of which come from the Brazilian coast; but it is distinguished by the length of the cephalic appendages from the former, and by the size of the eyes from the latter. The *Nereis albicans* of Grube, also from Brazil, differs in the structure of the feet and bristles. On the other hand, the feet somewhat resemble those of Stimpson's *Nereis abyssicola*[2] from Long Island, but the want of precision in his description leaves room for doubt.

Family Staurocephalidæ.

The representatives of this family seem to be as comparatively few in most latitudes, as they are small in size. Grube mentions three species from St. Croix and Costa Rica in his Annulata Œrstediana, under the generic name of *Anisoceras*, but the latter lapses in favour of *Staurocephalus*, which he had adopted the previous year. In his account of the Annelids collected by the German exploring ship "Gazelle" no example of the genus is mentioned. Two, however, are given in his Annulata Semperiana, viz., one from Singapore, and the other from Bohol, one of the Philippines, a male with the reproductive

[1] Annulata Nova, *op. cit.*, p. 170 (*Öfversigt k. Vetensk.-Akad. Förhandl.*).
[2] Marine Invertebrata of Grand Manan, p. 33.

elements from the latter locality showing large confluent eyes. Kinberg met with several, but none appear to have been found by Schmarda. Most of those described up to this time may with propriety be placed under the original genus; but, for instance, the species from North Uist in the Outer Hebrides may bear the late Prof. Keferstein's name *Prionognathus*,[1] since it differs from *Staurocephalus* in the absence of the distal articulation to the dorsal cirrus, and other particulars. In regard to this point, therefore, I would differ from the opinion of my late esteemed friend Prof. Grube, who grouped them all under the single genus *Staurocephalus* in his comparatively recent resumé.[2]

The occurrence of a species of this group at a depth of 1000 fathoms is noteworthy, for hitherto they have generally been procured in shallow water or the littoral zone.

Staurocephalus, Grube.

Staurocephalus australiensis, n. sp. (Pl. XXXVI. fig. 6; Pl. XVIIIA. figs. 9, 10).

Habitat.—Dredged at Station 162 (off East Moncœur Island, Bass Strait), April 2, 1874; lat. 39° 10′ 30″ S., long. 146° 37′ E.; depth, 38 fathoms; surface temperature, 63°·2; sea-bottom, sand and shells. This Station seemed to be rich in peculiar forms.

The specimen represented the posterior region of a large example of the genus, and is distinguished by its great flattened dorsal cirri (which presented an analogy with the peculiarly flattened dorsal cirri of *Polynoë platycirrus* from the same region).

The fragment is about 11 mm. in length, and its transverse diameter in front is about 5 mm. The dorsal surface is rounded, the ventral somewhat flattened, and grooved in the middle line. It tapers rather abruptly posteriorly, and has the usual definitely marked segments characteristic of the genus.

One of the most conspicuous features is the great size of the dorsal cirri, which, springing from the base of the foot dorsally, extend considerably beyond its tip. The terminal segment of the process is well marked, and many show a slight enlargement below it. In the interior of the cirrus is a slender tapering spine, which trends from the great spine of the foot near its base.

Superiorly the free edge of the foot presents two prominent mamillæ, between which the bristles of the region emerge. The upper series consists of a few slender tapering bristles, flattened towards the tip, and one or two shorter and less attenuate forms inferiorly. The latter also present a distinct notch at the extremity (Pl. XVIIIA. fig. 9). Both groups are comparatively short when contrasted with those of *Prionognathus*.

[1] Prionognathus kefersteini, M'I., *Trans. Roy. Soc. Edin.*, xxv. p. 417, 1869.

[2] *Jahres-Bericht der Schles. Gesellsch. f. vat. Cultur*, 1878, p. 109 *et seq.*

The bristles of the inferior tuft are translucent. The terminal or dilated portion of the shaft presents minute serrations along its convex edge, and the distal articulation is comparatively short, resembling that observed in *Onuphis* and others. It has a boldly bifid tip (Pl. XVIIA. fig. 10) with a thin process or guard.

All the bristles are very much larger than those of any known example of the genus.

The cuticle seems to be thin, but the hypodermic tissue is largely developed, both on the body-wall and the dorsal cirri, which have long parallel vessels running from the centre to the circumference. These organs (which appear to be blood-vessels) are probably branchial in function. The circular muscular fibres are well developed, both dorsally and ventrally, and the vertical and oblique are strong. The longitudinal ventral muscles are elliptical in section, and appear to be formed of a double fold. The nerve-cords, as usual in the group, are very large. The alimentary canal has a very regular series of folds internally, each fold being somewhat dendritic in section.

The dorsal cirrus and other parts of the foot of this form approach the structure of the foot of the *Anisoceras* of Grube,[1] from St. Catherine on the coast of Brazil. The head and other parts of the latter clearly demonstrate its connection with the Staurocephalidæ, and Grube indicates in his description and outline of the foot that the inferior bristles are jointed. Two brownish-red bars occur in each segment. Grube in this paper does not mention its relationships, but Ehlers and he[2] do so subsequently, the genus being merged into *Staurocephalus*. The *Staurocephalus lovéni* of Kinberg,[3] from Port Jackson, Sydney, differs in having a shorter dorsal cirrus, in the position of the ventral cirrus, and in the presence of eyes.

Staurocephalus atlanticus, n. sp. (Pl. XXXVI. figs. 4, 5; Pl. XVIIA. figs. 5–8).

Habitat.—Procured by the dredge at Station 73 (west of the Azores), June 30, 1873; lat. 38° 30′ N., long. 31° 14′ W.; depth, 1000 fathoms; bottom temperature 39°·4, surface temperature 69°·0; sea-bottom, Pteropod ooze.

A few fragments of this comparatively large example of the genus occurred. The longest (anterior) portion measures about 7 mm., and has a diameter of 1·5 mm.

The head (Pl. XXXVI. fig. 5) is well marked, forming anteriorly an elongated blunt cone, without trace of eyes, and having at each side a short tentacle. No other process remains on the head. The mouth opens inferiorly in the buccal segment immediately behind the former. The dark teeth shine through the body-wall in the next segment (which bears no foot).

The body is more rounded dorsally than ventrally, and divided into very distinct segments. The two somites behind the head are devoid of feet, but the third has

[1] *Archiv f. Naturgesch.*, 1858, p. 213. [2] *Op. cit.* [3] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1864, p. 574.

a pair somewhat shorter than the succeeding, a large ventral cirrus being present but no dorsal. About the anterior third the feet (Pl. XXXVI. fig. 4) project boldly outward, and each has an elongated dorsal cirrus with a terminal segment, but without a central bristle. It springs from the dorsal margin of the foot near the base, whereas the ventral cirrus arises from the foot near the tip. In this respect it is more nearly allied to Keferstein's *Staurocephalus ciliatus*[1] than to the British *Prionognathus kefersteini*.[2]

Dorsally are two kinds of bristles, viz., a very long, slender, and extremely attenuate series with an upward curve and serrated very distinctly from the upper part of the shaft a considerable distance along the convex edge of the tapering extremity (Pl. XVIIA. fig. 8); and another group shaped somewhat like the tip of the jointed bristles inferiorly, but without the terminal region, and having a much larger number of serrations (about sixteen) on the convex edge of the tip. The latter is rather blunt, and beneath it is a secondary process, projecting outward at an angle of 45°. A well-marked wing passes down the ventral or convex side, and is lost in the serrations (Pl. XVIIA. fig. 5).

Ventrally are a series of jointed bristles with curved shafts, dilated toward the tip, which is serrated on the convex side. The terminal piece is very long in the upper bristles (Pl. XVIIA. fig. 6), but diminishes inferiorly (fig. 7). It is shaped somewhat like that in *Hesione*, and appears to have a bifid tip. Amongst these bristles are also a few slender elongate forms with serrations on the curvature as in the superior division (fig. 8). The tips of the jointed bristles have a slight but characteristic bend, and there are traces of a minute secondary process. The bristles at the ventral edge of the series have shorter extremities than those represented.

The dental apparatus of this species approaches that of the typical members of the group, and consists of a dense double row of recurved horny points on each side. They are smaller in front, and become more massive toward the posterior third. The upper processes are more or less denticulated toward the tip, resembling those of *Staurocephalus rudolphii*, as figured by Ehlers, rather than *Staurocephalus rubrovittatus*, the individual processes or teeth being short and stout, as are also the three or four lateral denticulations in the larger forms toward the posterior third. A minutely denticulated ridge runs obliquely downward just before each row terminates. The mandibles also approach those of *Staurocephalus rudolphii*, though the anterior separate denticulations are less numerous. One of the mandibular rami has a broad spur anteriorly.

The hypodermic layer of the body-wall is thick. The longitudinal ventral muscles are more ovoid in transverse section than in the previous form. The great nerve-cords lie between them. The oblique muscles in some sections seem to unite above the cords, while other fibres (vertical) pass down by their sides. The glandular tissue of the alimentary wall is somewhat lax internally, probably from areolæ.

[1] *Zeitschr. f. wiss. Zool.*, Bd. xii. p. 99, Taf. viii. figs. 13–20.
[2] *Trans. Roy. Soc. Edin.*, vol. xxv. ii. p. 417, pl. xvi. fig. 11.

This species diverges from *Staurocephalus rubrovittatus*,[1] Grube, in the structure of the bristles, which are much more slender in the new form. The articulated tentacles of *Staurocephalus rudolphii*, D. Chiaje,[2] readily separate it from the new species. It more nearly approaches Keferstein's *Staurocephalus ciliatus*,[3] from which, however, it differs in the structure of the bristles and in the absence of the eyes. The new form is specially distinguished by the great length of the terminal portions of the bristles.

Family Lumbrinereidæ.

The Lumbrinereidæ are represented by a tolerably numerous series (about fifteen different species), several of which are new. In most of the previous voyages examples of the family have occurred, though in varying numbers. Thus Grube describes two species, in the Annulata Œrstediana, from the coast of South America and the adjoining Ocean. Schmarda gives upwards of half a dozen from the most diverse parts of the world, but his classification is somewhat confused. A large number (about fifteen or sixteen) are described by Kinberg in the voyage of the frigate "Eugenie"; while only three occur in Grube's Annelids of the "Gazelle" Expedition. Four genera and five species are represented in the latter author's Philippine Annelids. The species found in the Challenger range from tide-marks to very great depths (*e.g.*, 2225 fathoms), indeed, Ehlers has already shown that the common *Lumbriconereis fragilis*, O. F. Müller, procured in the "Porcupine" Expedition, descends to 1380 fathoms.

One of the most comprehensive resumés of the group is that of the late Prof. Grube,[4] whose extensive acquaintance with foreign Annelids peculiarly fitted him for such a task.

In regard to the dental apparatus in this group, the colour, even in small examples, is generally of darker hue than in the Eunicidæ. The maxillæ are characteristically elevated in front of the posterior (spathulate) processes, so that the blades curve downward in front and the spathulate appendages behind. The horny plates (great dental and lateral) are symmetrical. In the usual position in which many are found after preservation, the points of the maxillæ, and the cutting edges of the great dental plates, are directed upward. Moreover, a symmetrical arrangement of the three ventral horny plates (the two lateral in front and the great dental plate behind) is visible inferiorly. In protrusion of the proboscis, again, the lateral plates become external instead of anterior. The mandibles are generally ankylosed in front. From the position and curvature of the various parts of this apparatus it is difficult to give a fair representation of the parts.

[1] *Archiv f. Naturgesch.*, 1855, p. 97, and 1860, *char. emend.*, p. 79.
[2] Memorie s. storia, &c., iii. p. 166 (Nereis di rudolphi) and p. 176, Tav. xliii. fig. 13, &c.
[3] *Zeitschr. f. wiss. Zool.*, Bd. xii. p. 99, Taf. viii. figs. 13–19.
[4] *Jahres-Bericht. der Schles. Gesellsch. f. vat. Cultur.*, 1878, pp. 78–109.

Notocirrus, Schmarda, *char. emend.*

Notocirrus capensis, n. sp. (Pl. XXXVII. figs. 3, 4; Pl. XVIIIA. fig. 15).

Habitat.—Found between tide-marks at Sea Point, near Cape Town.

A form measuring about 160 mm. in length and about 3·5 mm. in breadth at the anterior third. It closely resembles the so-called *Notocirrus tricolor*, Johnston, in external appearance.

The head (Pl. XXXVII. fig. 3) approaches that of the dark varieties of *Notocirrus tricolor*, Johnston. Near the posterior border, on the dorsal surface, are four eye-specks, those on the right being less distinct than those on the left. The ventral surface is marked by a broad longitudinal furrow, which is longer than in *Notocirrus tricolor* from Guernsey.

The dental apparatus is more deeply placed than in *Lumbriconereis*. The maxillæ are proportionally short, the anterior fang being within the margin of the great dental plate. There are six large teeth at the base of each maxilla, internally. The latter seems to be armed throughout its inner border, about fourteen teeth being visible in the plate examined. Four plates occur in front of the latter. The most anterior has a single long curved hook; the next has a long tooth and four shorter; the third presents three teeth; the fourth (that adjoining the great dental plate) shows four or five teeth, which like all the previous are proportionally large and sharp. In addition there are certain isolated horny processes, but their connections could not be accurately determined. The mandibles are dark brown, with a broad anterior region and a pair of short, widely separated limbs. The dentary edge is broad, obliquely conical, and slightly notched. The apex alone is slightly paler than the rest. The median fissure reaches the centre of the anterior region. Very long chitinous rods pass backward from the base of the maxillary region.

In the structure of the teeth this form then wholly differs from the British *Notocirrus tricolor*, Johnston, the dentition in which approaches *Arabella*, an opinion shared by the late Prof. Grube.

The feet (Pl. XXXVII. fig. 4) resemble those of the British species, the posterior lobe being well developed, and directed at a considerable angle to the rest of the foot, backward, upward, and outward. On minute examination, however, it appears that the dorsal process or papilla is much less developed than in *Notocirrus tricolor* of the same size, and this feature is most marked in the anterior third, where the contrast is very evident in the specimens from Guernsey.

Unfortunately the bristles of the tenth foot are absent. At the thirtieth there are three groups of short bristles with wings, a larger superior series, and two smaller inferior. All are tinged of a brownish hue, and the edges of the wings of the lower bristles in the upper group are more distinctly though more minutely serrated than the others

The posterior bristles (Pl XVIIIa. fig. 15) are tinged of a deeper brownish hue than in *Notocirrus tricolor.*

The tail is somewhat imperfect, but it seems to have been terminated by two large dorsal and two smaller ventral processes.

The cuticle is comparatively thick, and the hypoderm and circular muscular coat well developed. In the structure of the body-wall this form shows somewhat smaller ventral longitudinal muscles than in *Notocirrus tricolor*, Johnston, while the oblique muscles are strongly marked, part of the fibres apparently terminating inferiorly opposite the superior angles of the nerve-cord, the rest passing down to decussate in the middle line ventrally, the fibres probably running into the circular coat. The strong vertical fibres pass from the upper angles of the nerve-area to the wall of the alimentary canal, enclosing the ventral blood-vessel in the intermediate space. The binding of the nerve-trunk at intervals, by the muscular fibres just mentioned, is noteworthy. The dorsal longitudinal muscles are proportionally as powerful as in *Notocirrus tricolor.* The muscularity of the walls of the dorsal and ventral blood-vessels is conspicuous. The great size of the various muscles of the body-wall in these forms probably causes rigid contraction, so that the alimentary canal occupies a small area in the preparations. The inner margin of the canal is opaque in section, thus forming a definite boundary to the more lax and translucent glandular tissue intervening between the former and the muscular layer. A peculiar dark streak occurs in sections of the nerve-cord superiorly, but no distinct canal is apparent.

Schmarda[1] originally described *Notocirrus* as possessing both jointed and simple bristles, but the more systematic grouping of Kinberg[2] and Ehlers[3] is preferable. Grube[4] takes as the type the *Notocirrus chilensis* of Schmarda, which possesses a dental apparatus wholly different from the foregoing, but it is doubtful if this arrangement obviates the difficulties which are entailed on students of the group by Schmarda's confused classification.

Laranda, Kinberg.

Laranda longa, (Webster) (Pl. XXX. fig. 10; Pl. XXXVII. fig. 5).

Drilonereis longa, Webster, Annél. Chétop. Virginian Coast, Trans. Albany Inst., vol. ix. p. 40.

Habitat.—Dredged at Station 47 (off the American coast between Halifax and New York), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; surface temperature, 42°·0; sea-bottom, blue mud.

A slender species, about 42 mm. in length and a little more than 1 mm. in diameter.

[1] Neue wirbell. Thiere, I. ii. p. 115.
[2] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1865, p. 573, &c.
[3] *Op. cit.*, Bd. ii. p. 397.
[4] *Jahres-Bericht. der Schles. Gesellsch. f. vat. Cultur.*, 1878, p. 81.

The head presents the usual conical shape, and is without trace of eyes. The proboscis is extruded (Pl. XXXVII. fig. 5).

The body tapers distinctly anteriorly, remains about the same diameter some distance behind the anterior third, and then probably tapers toward the tail, but as the specimen is incomplete posteriorly, the condition of the tail is doubtful. The segments are comparatively distinct, and their antero-posterior diameter is considerable. Two clear segments exist in front, as far as can be made out, for the feet are indicated only by a minute papilla and a microscopic spine and group of bristles. The foot (Pl. XXX. fig. 10) quite differs from that of *Notocirrus scoticus* in having a much smaller dorsal process or cirrus, and the bristles with wings have much more slender tips. As a rule, about four spines are included in the foot, at the base of the long bristles. In their ordinary position in the animal, the bristles are in front of the papilla.

The dark brown dental apparatus (Fig. 3) appears to be allied to that in *Arabella*. The maxillæ are abruptly curved or hooked anteriorly, and their base is armed with three curved teeth, the points of which are directed backward. The representative of the great dental plate has only three long curved teeth. Three processes exist in front of the latter. The first and second carry a single tooth, the first being the smaller. The third carries a long tooth and two minute points on a process at the base. From the posterior end of the maxillary region a narrow horny rod passes backward a short distance, and then splits into two long processes. The mandibles are absent. Unfortunately the teeth of this form are so injured that only an idea of them is obtainable from the accompanying woodcut.

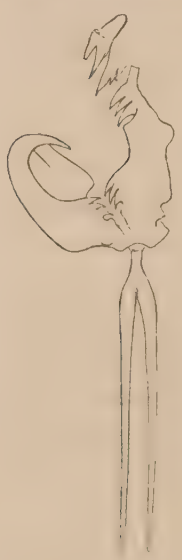


Fig. 3.—Dental apparatus (injured) of *Laranda longa*, (Webster); × 55 diameters.

This appears to agree in general structure with Webster's species, though, probably from the imperfect condition of the specimen posteriorly, none of the feet showed the bifid condition, which the American author found only in the posterior third of the animal. Webster's specimens were found abundantly in mud and sandy mud at low water on the Virginian coast, so that the bathymetrical range of this species is very considerable. It is noteworthy that this example had no mandibles. Webster found considerable variety in this respect. The same author observed that the anterior dental plates have only a single sharp, curved tooth, but in the present example the posterior (second) has three teeth. Webster placed the form under the genus *Drilonereis* of Claparède,[1] but the latter differs in certain essential respects in regard to the structure of the foot, which agrees more with the typical Lumbriconereidæ, and in the smooth condition of the bases of the maxillæ. The statement of Kinberg,[2] "Radix tertia radicibus binis solitis brevior,"

[1] Annél. Chétop., Naples, p. 144, and Supplement, p. 35, pl. ii. fig. 4.

[2] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1864, p. 573.

is of considerable importance, and it is probable that another genus may be necessary for those species with the bifid posterior processes.

Lumbriconereis, Blainville, *char. emend.*

Lumbriconereis pettigrewi,[1] n. sp. (Pl. XXXVI. figs. 7, 8, 9; Pl. XVIIa. figs. 11–15).

Habitat.—Dredged at Station 141 (off the Cape of Good Hope), December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms; bottom temperature 49°·5, surface temperature 66°·5; sea-bottom, green sand.

A species about 100 mm. in length and nearly 2·5 mm. in breadth; apparently in considerable abundance.

In external appearance it very much resembles *Lumbriconereis fragilis*, O. F. Müller, but, as the specific distinctions rest on so many minute points, little reliance can be placed on the former.

Viewed from the dorsum, the head (Pl. XXXVI. fig. 7) forms a somewhat pointed cone, generally with a median groove or depression, which, however, does not reach the apex. At the sides posteriorly the ventral "bosses" often project a little beyond the margin. A few longitudinal streaks occur on the ventral surface. In the buccal segment the oral margin is deeply crenate, and marked by longitudinal lines. From the boss on each side a ridge proceeds backward and inward on the roof of the mouth, and the two are separated by a deep groove.

The maxillæ (Fig. 4) are dull brownish, and the spathulate processes posteriorly (Fig. 5) are blackish-brown. The great dental plate on each side presents four teeth. The lateral plates, which are arranged transversely in front, are terminated dorsally by a prominent tooth, the outer (and larger) plate having the longer. These teeth turn inward when the sides of the dental apparatus are drawn together. Close behind the outer lateral tooth is a small horny patch, followed after an interval by a longer bar running backward to the posterior third of the maxilla on each side. The halves of the mandible (Fig. 6) are ankylosed anteriorly, and have a broad V-shaped ventral surface, the dark and nearly parallel lines passing from side to side continuously.

The feet are similar to those of the Norwegian examples of *Lumbriconereis fragilis*, but the bristles are less developed, and do not possess the blackish-brown tinge in their shafts. The contour of the upper part of the lobe is also different, and there are only three black spines in the Challenger form, whereas in the European there are five or six. The groups of bristles, however, are about the same number in the tenth foot (Pl. XXXVI. fig. 8) of each, viz., five, the upper (Pl. XVIIa. fig. 11) being the longer. In *Lumbri-*

[1] Named after my colleague, Prof. Pettigrew, well known for his anatomical researches and for his elaborate investigations on flight.

conereis fragilis the number of the bristles is greater. Malmgren's figure[1] seems to be peculiar, since he only represents two sets of bristles. The bristles in the present form are moderately elongate, and have the usual structure, though they are somewhat

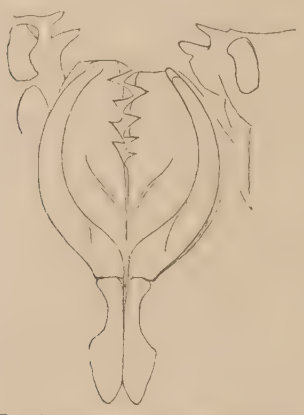


FIG. 4.—Maxillæ and dental plates of *Lumbriconereis capensis*, Grube, folded; enlarged.

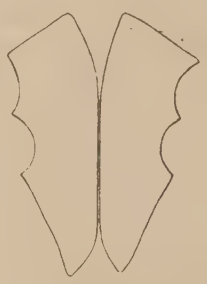


FIG. 5.—The posterior part of the maxillæ separated; enlarged.

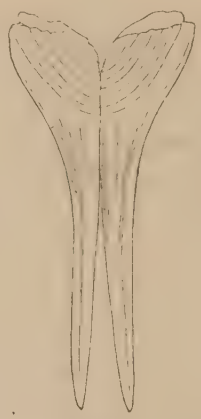


FIG. 6.—Mandibles of the same from the ventral surface; similarly enlarged.

shorter than in *Lumbriconereis fragilis*. The tips of the bristles (Pl. XVIIA. fig. 12, from the inferior border) in the three inferior groups of the tenth foot are so slender that they bend in the solution of calcium chloride.

At the thirtieth foot (Pl. XXXVI. fig. 9) only two black spines occur, and the tips of the second group of bristles are generally much attenuated. The extremities of the inferior groups are shortened, and a winged hook occurs in most of them. The fiftieth foot has strong winged hooks superiorly, then a pair of slender bristles with short tips, and inferiorly hooks of a more delicate formation. Posteriorly only hooks are present. The stoutest hooks occur superiorly, and they show a considerably larger tooth at the base, and a series of smaller serrations superiorly, generally about four (Pl. XVIIA. fig. 13, representing a newly developed hook, not yet injured by use; and fig. 14, an antero-posterior view of a smaller inferior hook). Each hook is guarded by the double wing, which, as Claparède[2] shows in *Lumbriconereis nardonis*, may be drawn back like a hand. The tail is terminated by two styles, one on each side of the anus.

An allied form, dredged at the same place, is distinguished from the foregoing by the presence in the fourth group of the tenth foot of a single winged hook (Pl. XVIIA. fig. 15) with an elongate tip (as in certain European species). Its occurrence indicates a somewhat advanced position of these organs, which in the typical species occur only in the segments behind the tenth. The hook does not differ in structure from the anterior ones in the typical example. The only other feature is a slight increase in the length of the tips of the second group of superior bristles in the same region, and the absence of the black spines.

[1] *Op. cit.*, pl. xiv. fig. 83B.

[2] Annél. Chétop., Naples, p. 147, pl. ix. fig. 3.

The differences just noted in the bristles are borne out by an examination of the dental apparatus, for though this has been crushed, apparently by the dredge, sufficient remains for identification. The maxillæ have eleven larger translucent hard tips, and the basal ridges do not correspond. The spathulate processes posteriorly are broader. The outer line of the brown horny dentary region of the great plates forms a bluntly angular projection instead of the straight line which characterises the former. The left plate has four, the right five, teeth. The outer lateral plate in front is considerably larger, and instead of a single long inner tooth, there are two (both shorter). Moreover, the adjoining posterior plate has a process which projects forward into the notch between the two teeth. The inner lateral plate has a shorter tooth than in the former species. The dentary surface of the mandibles presents ventrally a crescentic aspect, with a V-shaped median notch. The outer tips are black, and from them a brownish veined band curves from side to side.

In the intestine are little sand masses containing numerous *Globigerinæ* and other Foraminifera, with sponge-spicules, sand-grains, and other debris.

The structure of the body-wall of this form (Station 141) corresponds in general with the European type, but the muscular fasciculi are less regular. The nerve-cords, with the large superior neural canal, are embraced by the ventral longitudinal muscles in the same manner. A comparatively narrow pedicle connects the area with the hypoderm inferiorly.

The dental apparatus of this species somewhat approaches the *Lumbriconereis* (*Notocirrus*) *tetraurus* of Schmarda,[1] from the Cape and Chili, but the presence of a considerable dorsal cirrus on the foot, and the structure of the posterior hooks, are essential points of difference. Grube's *Lumbriconereis cavifrons*,[2] from the same region (Lime Bay, Cape of Good Hope), is easily distinguished by the presence of seven teeth in the great dental plates and the almost globular excavated head; while his *Lumbriconereis capensis*[3] has from five to seven teeth in the great dental plates, the foot is abbreviated and the lamella short and bluntly rounded. He does not describe the head, so that the details are incomplete.

Lumbriconereis bifurcata, n. sp. (Pl. XXXVI. figs. 10, 11, 12; Pl. XVIIA. fig. 16).

Habitat.—Dredged at Station 232 (off the southern shores of Japan), May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; temperature of the bottom 41°·1, surface temperature 64°·2; sea-bottom, green mud.

The single fragmentary example measured about 145 mm. in length and about 5 mm. in breadth.

The head (Pl. XXXVI. figs. 10, 11) in the preparation forms a somewhat acute cone, marked dorsally by a few longitudinal streaks. Ventrally the mouth and other

[1] *Op. cit.*, I. ii. p. 117. [2] Annel. Novara-Exped., Zool. Theil., p. 13, Taf. i. fig. 5.
[3] *Jahres-Bericht. der Schles. Gesellsch. f. vat. Cultur.*, 1878, p. 95.

parts have the ordinary structure, the crenations and grooves of the posterior lip involving both the buccal segments.

The maxillæ (Fig. 7), like the dental apparatus in general, is blackish-brown, and their downward curvature a little beyond the broad region at the base is pronounced. The spathulate posterior surfaces are broad, and the ends are evenly rounded. There is no constriction. The left great dental plate has five teeth, the right six. The lateral plate next the latter is narrow, and ends in a blunt tooth. The outer (anterior) plate is much larger, and the inner edge is produced into a sharp tooth. The small plate immediately behind is pale brownish, thus contrasting with the rest of the apparatus, and it points into the notch next the tooth. The long horny bar passing backward from the former bends slightly outward, and terminates in a point quite removed from each great dental plate. The four plates just described are symmetrical. The mandibles

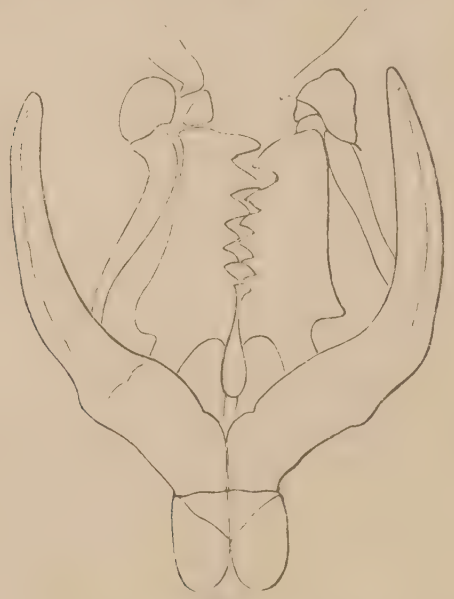


Fig. 7.

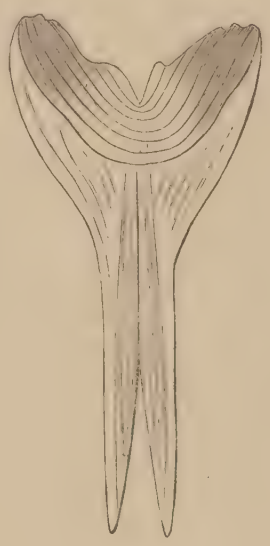


Fig. 8

FIG. 7.—Maxillæ and dental plates of *Lumbriconereis bifurcata*, from the dorsal aspect; × 15 diameters.
FIG. 8.—Mandibles of *Lumbriconereis bifurcata*, from the ventral surface; magnified.

(Fig. 8) are clavate, the anterior region being broadly triangular, the posterior forming slender and tapering shafts. The ventral dentary surface is somewhat semicircular, with curved veins from side to side. On each side of the median notch is a tooth. The striking point is the downward curvature of the maxillæ, both anteriorly and posteriorly, the elevation occurring just in front of the spathulate posterior region.

The body is slightly tapered in front, remains for a considerable distance of nearly uniform calibre, and again tapers toward the tail. The feet resemble those of *Lumbriconereis fragilis* in front, but posteriorly they are distinguished by the presence of two nearly symmetrical lobes, one in front and the other behind the vertical row of

bristles, thus imparting a character to the species. The lobes are low and slightly pointed, and are directed outward and slightly upward. Toward the posterior end these processes are longer than the foot, and, indeed, increase in size from before backward.

The bristles of the tenth foot have nearly the same shape as in *Lumbriconereis fragilis*, and their shafts are also of a brownish-black colour; while the spines nearly correspond in number and colour. Indeed, nothing very diagnostic can be affirmed of the bristles or hooks of the Japanese form, except perhaps the larger size of the hooks and the very distinct serrations on the crowns. The latter differ from those of *Lumbriconereis fragilis* in the more evident distinction between the first (or lower) fang and the second, as well as the relatively larger size of the latter in some views in comparison with the superior serrations (Pl. XVIIA. fig. 16). Position, however, apparently modifies these appearances. The specimen, a female, is distended with ova.

The intestine contains greyish sand abounding in sponge-spicules, remarkable Radiolarians (?), composed of a minutely reticulated framework, with projecting processes more minutely reticulated. The spines on some cause the structure to resemble a minute *Molpadia*. A few Foraminifera, Diatoms, and fragments of Algæ are also present.

Within the circular muscular coat is a peculiar pennate arrangement, apparently of the outer fibres of the dorsal and ventral longitudinal muscles, the granular infolded parts being coloured brownish. The nerve-cords have a small median neural canal beneath the great superior one.

This species has certain affinities with the *Lumbriconereis heteropoda* of Marenzeller,[1] from the Bay of Miya, Southern Japan. The peculiarly elongate foot of the latter, however, is diagnostic, though the structure of the bristles is similar. The shape of the bases of the maxillæ diverges considerably. The posterior feet of Kinberg's *Lumbriconereis chilensis*,[2] from Valparaiso, show a similar bilobed arrangement in the posterior feet, but the lobes are much longer, and the structure of the bristles differs. In regard to the two bosses on the under surface of the snout, this form shows certain resemblances to the *Lumbriconereis jacksoni* of Kinberg,[3] from Sydney, but in the dental apparatus (which appears to be of a type unusual in *Lumbriconereis*), the structure of the feet, and the outline of the head, the differences are pronounced.

Lumbriconereis japonica, Marenzeller (Pl. XXXVI. figs. 13, 14, 15; Pl. XVIIA. fig. 17; Pl. XVIIIA. fig. 1).

Lumbriconereis japonica, Marenzeller, Denkschr. d. k. Akad. d. Wiss. Wien, 1879, Sep. Abd., p. 29, Taf. v. fig. 3.

Habitat.—Taken along with the foregoing at Station 232 (off the coast of Japan),

[1] Südjapan. Annel., p. 30, Taf. v. fig. 4, and Taf. vi. fig. 1.
[2] Freg. Eugen. Resa, Taf. xviii. fig. 37; and *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1865, p. 569.
[3] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1864, p. 569.

May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature 41°·1, surface temperature 64°·2; sea-bottom, green mud.

This species is considerably larger than the foregoing, resembling in bulk *Lumbriconereis capensis*. The total length of the fragments is about 140 mm., and the breadth of the widest region (anterior third) about 7 mm.

The body has the usual shape, being slightly tapered in front, and gradually diminished from the anterior third backward to the tail, which ends in four styles, two longer situated dorsally, and two shorter ventrally.

In this species the head (Pl. XXXVI. fig. 13) is thicker and less acute than in the previous forms, agreeing in this respect with certain British examples of the group. The

Fig. 9.

Fig. 10.

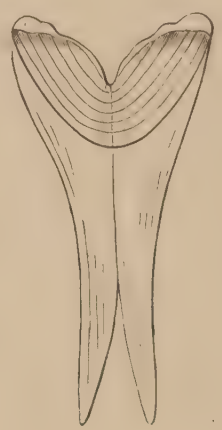


Fig. 11.

Fig. 9.—Lateral view of the maxillæ and dental plates of *Lumbriconereis japonica*; × 15 diameters.
Fig. 10.—Maxillæ and dental plates of *Lumbriconereis japonica*; × 15 diameters.
Fig. 11.—Mandibles of *Lumbriconereis japonica*, from the ventral surface; × 15 diameters.

snout, both dorsally and ventrally, is devoid of longitudinal lines. The oral region has three folds on each side, the "boss" in front and superiorly, and two beneath. The crenations on the margin appear to be less numerous than in *Lumbriconereis fragilis*, only three in the middle running backward to the posterior border of the posterior buccal segment.

When viewed laterally (Fig. 9) the maxillæ show the double curvature (anteriorly and posteriorly) even more distinctly than in *Lumbriconereis bifurcata*. In certain positions (as in the preparation) the serratures of the great dental plates stand prominently above the level of the maxillæ. The posterior spathulate processes (Fig. 10)

are short, broad, and pointed. Each great dental plate has four teeth. Three lateral plates occur in front of the latter, viz., a somewhat elongated plate next the foregoing, terminating in a sharp tooth; a quadrangular plate immediately in front (in ordinary positions), with a minute tooth at its upper and inner edge; and a triangular plate (like a cocked hat) fitting into the space formed on the outer side of the other two. An accessory plate lies outside the last, and a small bar occurs some distance in front of the long horny crescentic process running backward by the side of the maxillæ. The chief plates of the dental apparatus are of a brownish colour. In the mandibles (Fig. 11) the ventral dentary surface is crescentic, the external edge being pointed, and the whole marked by parallel veins. The anterior edge has a slightly tuberculated whitish deposit. The limbs are united backward to the terminal third.

At first sight the feet do not appear to differ much from those of *Lumbriconereis fragilis*, except in the shorter bristles, but a closer inspection shows (Pl. XXVI. figs. 14, 15) that the posterior elongated lobe is pointed superiorly in the Japanese form. The bristles are arranged in four groups, one of which, the inferior, is compound. The two superior fasciculi are composed of the ordinary bristles, with slightly brownish shafts and winged tips. The third series consists of about five jointed hooks (Pl. XVIIIA. fig. 17) with a very narrow wing along the ventral edge. The serrations on the crown of the hook are obscure, and are either abraded or originally defective.

The posterior hooks (Pl. XVIIIA. fig. 1) have longer and more slender tips than in the British form above mentioned, and, like the anterior, their crowns are smaller. A series of small teeth occurs, as usual, above the larger process inferiorly, and a distinct incurvation of the wing exists just below the crown.

In comparing this form with the British *Lumbriconereis johnstoni*, the dorsal winged bristles are longer and more attenuate, as are also the jointed hooks, the crowns of the latter, moreover, being less distinctly serrated. The bristles are more numerous in the Japanese species, and the posterior lamellæ more acute superiorly. The spines in the foreign forms are black, whereas in the British they are pale.

The intestine contains brownish mud, in which Diatoms, fragments of Crustacea, minute bristles of *Polynoë*, sponge-spicules, and peculiar ova are present.

In section the ventral nerve-cords have a much broader and shorter pedicle than in the common *Lumbriconereis*, and the neural canal is somewhat less. The central fibrous bundle of each nerve-cord is well seen in some sections just below the canal. The oblique muscles have the normal attachment superiorly. Some fibres of the circular muscular coat cross the nerve-area.

In the structure of the feet this form closely approaches Marenzeller's *Lumbriconereis japonica*,[1] from Southern Japan. There is a little discrepancy, however, in the outlines of the soft parts, and still more in the minute structure of the hooks, both anterior and

[1] Südjapan. Annel., p. 29, Taf. v. fig. 3.

posterior, but some of the latter differences may be due to indifferent figures. The maxillæ and dental plates nearly correspond, and it has been thought advisable to unite the forms. Marenzeller's example was procured on the east coast of the island of Ino-Sima, Japan.

Lumbriconereis kerguelensis, Grube (Pl. XXXVI. figs. 16, 17; Pl. XVIIA. fig. 18; Pl. XVIIIA. figs. 2–4).

Lumbriconereis kerguelensis, Grube, Jahres-Bericht. der Schles. Gesellsch. f. vat. Cultur., 1878, p. 92.

Habitat.—Dredged at Station 149G (off London River, Kerguelen), January 29, 1874; lat. 48° 50′ S., long. 69° 18′ E.; depth, 110 fathoms; surface temperature 40°·2; sea-bottom, volcanic mud.

A comparatively small form, the longest fragment measuring about 40 mm., with a breadth anteriorly of about 2·5 mm. In the general outline of the body it agrees with *Lumbriconereis nardonis*, Grube, from the Adriatic, that is, has a more obtuse head and more distinctly marked segments than *Lumbriconereis fragilis*.

The head (Pl. XXXVI. fig. 16) forms a large, bluntly conical and smooth process, marked dorsally by a little brownish pigment; while ventrally a depression or dimple occurs in the centre. The mouth has the ordinary lateral folds on each side, in front of the crenate oral margin. Compared with the common southern form (*Lumbriconereis nardonis*), the head is smoother and more rounded anteriorly, and the lines running from the border of the snout are wider.

Fig. 12.

Fig. 13.

FIG. 12.—Maxillæ and dental plates of *Lumbriconereis kerguelensis*; × 55 diameters.
FIG. 13.—Mandibles of *Lumbriconereis kerguelensis*, from the ventral surface; × 55 diameters.

The maxillæ (Fig. 12) are brownish, and the posterior spathulate processes taper to a somewhat fine point. Each great dental plate has four teeth, the last on the right being followed by an elevation of the dental edge. Two lateral plates exist in front, each terminating in a tooth externally (dorsally). That adjoining the great dental plate is somewhat triangular, while the outer plate widens from the tooth to an expanded or lobate end. A small brownish patch exists outside the tooth of the latter plate; and a slightly curved band stretches backward to the side of the maxilla. When the apparatus is viewed from the ventral surface, three horny inferior lobes project, viz., the two lateral plates, and the usual rounded process from the great dental plate. The mandibles (Fig. 13) ventrally present a crescentic dentary surface, somewhat pointed

externally (where the pigment is most marked), and crossed by the usual lines. A translucent thickening of the margin (calcareous cutting edge) occurs on one side.

The anterior feet somewhat resemble those of the species just mentioned, but posteriorly (Pl. XXXVI. fig. 17) they are less prominent in the form from Kerguelen. In the tenth foot the present form shows laterally a lobe much less pointed superiorly than in the other; and though similar, the number of the superior bristles is greater. There are three in the upper division and four in the second group of winged bristles; then four jointed hooks, and lastly two jointed hooks and a winged bristle inferiorly. The wing is well-marked in the superior bristles, especially in the second group (Pl. XVIIIA. fig. 2, representing that next the winged hooks); and the curvature at the tip is distinct. The winged hooks have a shorter tip than in the British species referred to (*Lumbriconereis nardonis*), and the wings or guards are better marked, both in the terminal piece and the shaft below it (Pl. XVIIIA. fig. 3, the upper hook of the series).

A very evident distinction from the British species occurs in the great length and attenuation of the bristles of the thirtieth foot (Pl. XVIIIA. fig. 4). The wing is very slightly developed, and is recognisable only at the curvature or "knee" of the bristle. On the other hand the British species presents bristles with short, broad tips.

The posterior hooks are characterised by the shortness of the wing and the prominence of the great tooth (Pl. XVIIA. fig. 18), as compared with a hook from the same region in the British species. The wing is much longer in the latter, its curvature at the tip different, the serrations of the crown less developed, and the neck longer.

The spines in the new species are pale.

Two of the specimens are females bearing large ova.

The intestine in two had minute masses containing numerous fine Diatoms and a few sponge-spicules.

In section the ventral nerve-area is proportionally larger than in the typical form, is connected with the hypoderm by a short and broad pedicle, and shows only a single small median canal superiorly. The hypodermic layer is well developed, and the circular muscular coat is remarkably thick.

This form evidently takes the place of the European *Lumbriconereis nardonis*, to which it is closely allied in the structure of the dental apparatus.

Studer[1] mentions that a small *Lumbriconereis* sp.? occurred amongst Algæ at Cascade Reach, Kerguelen, but gives no description.

Grube, in his summary of the genus, states under the head of *Lumbriconereis magalhaënsis*, Kinberg, that he had examined a very similar form in Kerguelen, but that it differed in having the second pair of jaws (great dental plates) furnished with four

[1] *Archiv f. Naturgesch.*, 1879, p. 125.

teeth, and that the somewhat ovoid head was longer than broad. Moreover, the third pair of dental plates have only a single tooth. In all probability the present corresponds with Grube's species.

Lumbriconereis neo-zealaniæ, n. sp. (Pl. XXXVI. figs. 18, 19; Pl. XVIIIA. figs. 5–9).

Habitat.—Trawled at Station 169 (north-west point of New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; sea-bottom, blue mud.

A somewhat small species, the longest specimen measuring about 60 mm., and anteriorly having a breadth of about 2 mm. The shape of the body agrees with that usually seen in the genus, and the segments are very distinctly marked.

The head (Pl. XXXVI. fig. 18) is rather elongated and pointed, with one or two longitudinal depressions dorsally, which, however, are omitted in the figure, and an evident

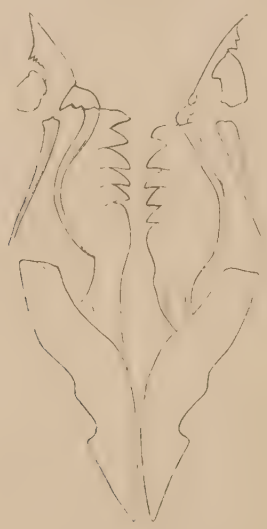


Fig. 14.

Fig. 15.

FIG. 14.—Maxillæ (broken) and dental plates of *Lumbriconereis neo-zealaniæ*; enlarged.
FIG. 15.—Mandibles of *Lumbriconereis neo-zealaniæ*; enlarged.

median groove ventrally. Both dorsal and ventral surfaces present a deposit of brownish pigment. The crenatures of the lips are similar to those in *Lumbriconereis fragilis*.

The dental apparatus, in variety A, is blackish-brown. The maxillæ (Fig. 14) are moderately curved, and a constriction exists at the base posteriorly in front of the wedge-shaped appendages. Each great dental plate has five teeth. The first lateral plate is elongated and somewhat triangular, with a single tooth; the next is petaloid, with a tooth on the inner margin, and two minute denticles further out. A small horny

area fits into the hollow of the latter near the tooth; and behind a slender bar runs backward to the side of the maxilla. The ventral surface of the mandibles (Fig. 15) has a dentary surface resembling a pair of bivalves (in one), or somewhat crescentic. The surface is marked by fine concentric lines, and a touch of dark pigment occurs at the outer angle. The lines are very distinct on the dorsal surface.

In variety B the maxillæ show a more distinct outward bend or "knee" posteriorly, the left great dental plate has four, the right five teeth. The two lateral plates are similar, but no minute external denticles occur on the anterior or outer. The ventral dentary surface of the mandibles is nearly semicircular, with a large amount of pigment at the outer angle. The lines are also concentric.

The general appearance of the feet (Pl. XXXVI. fig. 19) resembles that in *Lumbriconereis fragilis;* but in structure the bristles approach those of *Lumbriconereis ehlersii.* At the tenth foot the arrangement is closely allied to that in the latter, the chief differences being in the minor details of length and proportion.

Two varieties, however, occur in regard to the structure of the feet, viz., one (A) with black spines and bristles with deeply tinted shafts. In the tenth foot there are three black spines, and the bristles seem to be slightly longer than in the next form. Indeed in the succeeding feet (*e.g.*, about the thirtieth) the great elongation of the winged bristles (Pl. XVIIIA. fig. 5) is a marked characteristic in comparison with the other form. In this respect it resembles a variety (D) from the "Valorous" Expedition, which, however, does not show black spines.

The variety (B) with the shorter bristles has at the tenth foot two winged bristles in the superior group; three in the second, five winged hooks (Pl. XVIIIA. fig. 9) arranged in pairs, the odd one being inferior; and lastly a single winged bristle at the ventral edge. The differences between a winged bristle from the same foot in each is well shown by comparing the figure of that in the former variety with Pl. XVIIIA. fig. 8. Whether these differences have any relation to the sex remains to be seen.

The posterior hooks of the two varieties are closely allied, yet it is evident that the hooks of the long-bristled form (Pl. XVIIIA. fig. 6) are longer than those of the kind with shorter bristles, and slightly different in outline at the upper part (Pl. XVIIIA. fig. 7).

The black spines occur chiefly in the anterior region of the long-bristled variety.

It is difficult, perhaps, to say how much reliance should be placed on the characters which show divergence in these two forms, but it is well to indicate them.

In the intestine of the type with long bristles is a little muddy sand containing the hairs of minute Crustacea, a few Diatoms, and sponge-spicules.

The pedicle of the nerve-area in section is moderately developed, and the neural canal superiorly is much less than in the typical form. The whole area and pedicle form a pear-shaped mass, resting on the circular coat, which is comparatively thick.

This species is distinguished from the *Lumbriconereis* (*Notocirrus*) *sphærocephalus* of Schmarda,[1] from Auckland, New Zealand, by the shape of the head, the structure of the feet, and the bristles. In Schmarda's form the foot bears a short cirrus, and thus the divergence is pronounced.

Lumbriconereis abyssorum, n. sp. (Pl. XXXVI. figs. 20, 21 ; Pl. XVIIIA. fig. 10).

Habitat.—Trawled at Station 298 (off the west coast of South America, a little south of Valparaiso), November 17, 1875 ; lat. 34° 7′ S., long. 73° 56′ W.; depth, 2225 fathoms ; bottom temperature 35°·6, surface temperature 59°·0 ; sea-bottom, blue mud.

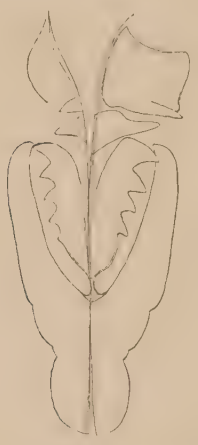


Fig. 16.

Fig. 17

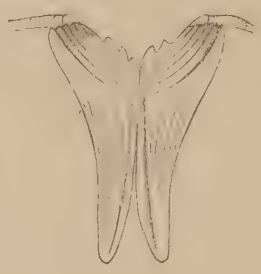


Fig. 18.

FIG. 16.—Maxillæ and dental plates of *Lumbriconereis abyssorum ;* × 90 diameters. The position of the maxillæ in this figure prevents the curvature being seen. The right anterior dental plates are flattened out.

FIG. 17.—Tip of one of the maxillæ of *Lumbriconereis abyssorum*, so as to show the curvature ; × 90 diameters.

FIG. 18.—Mandibles of *Lumbriconereis abyssorum ;* × 90 diameters.

A fragmentary example, measuring about 24 mm. in length and about 2 mm. in breadth anteriorly.

So far as external appearance goes, this abyssal form differs little from a specimen of *Lumbriconereis fragilis* of the same size, except in regard to the structure of the lamellæ of the anterior feet.

The head (Pl. XXXVI. fig. 20) is somewhat larger and broader, but the mouth and other parts do not present any noteworthy difference from the common form just mentioned.

The dental apparatus (Fig. 16) is brownish, with darker touches. The maxillæ in the contracted condition of the included proboscis have their hooked tips (Fig. 17) directed upwards. The spathulate appendages posteriorly are broad, each approaching a semicircle. The left great dental plate has four teeth, the right four, but the two median are separated

[1] Neue wirbell. Thiere, I. ii. p. 116.

by an interval from the first and last. The latter, however, may be accidental. The first lateral plate is almost wedge-shaped, and ends in a sharp tooth. The second forms a much larger quadrangular area, with a single tooth next the foregoing. Instead of a separate accessory plate, so generally present posteriorly, a process of this anterior plate (occupying a similar position) represents it. The curved bar running backward to the maxilla is comparatively short on one side, longer on the other (left). The size and shape of the anterior lateral plate is characteristic on viewing the dental apparatus from above. The ventral dentary surface of the mandibles (Fig. 18) is crescentic, but the median fissure is very distinct, and the union of the limbs somewhat lax. Two prominent teeth occur on the anterior margin on each side of the middle line, besides an elevated ridge externally. The black pigment below the latter sends off broad touches which proceed a short distance backward, and rather wide parallel veins which meet those of the opposite side.

About the tenth foot the posterior lobe is much more pointed superiorly in the abyssal species, and the winged bristles much longer and more slender, as well as devoid of the deep tinge seen in the shafts of those of *Lumbriconereis fragilis*. The spines in *Lumbriconereis abyssorum* are also pale. At the thirtieth foot the bristles and spines show the same differences, but as the specimen has lost its hooks, a minute comparison cannot be made.

The posterior hooks (Pl. XVIIIA. fig. 10) differ from those of *Lumbriconereis fragilis* (from the same region) in having a smaller and more elongated tip with a less pronounced curve and less distinct serrations on the crown.

The posterior end is in process of regeneration.

In section of the body-wall the nerve-area is comparatively large and sessile, and the ventral longitudinal muscles do not so closely surround and even surmount it laterally as in the typical form. No neural canal is visible in the preparation, but the condition of the latter perhaps gives a margin for doubt in regard to minute structure.

It is uncertain whether the *Lumbriconereis brasiliensis* of Grube,[1] from the Atlantic, off Rio Janeiro, is closely connected with this species, though it has four teeth in the great dental plates. It differs also in having two eyes. The foot of *Lumbriconereis abyssorum* somewhat resembles Schmarda's *Lumbriconereis* (*Aracoda*) *heterochæta*,[2] but the dental armature shows considerable differences behind the maxillæ. This was also procured off Valparaiso. The *Lumbriconereis atlantica* of Kinberg,[3] from the Atlantic, off the mouth of the River Plate, which has four teeth in the great dental plates, differs from the present form in the structure of the head.

[1] Annul. Œrstediana, 1857 (sep. Abd.), p. 2.

[2] Neue wirbell. Thiere, I. ii. p. 116.

[3] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1864, No. 10, p. 568. Reference is given to pl. xix. in the Voyage of the "Eugenie." The most complete copy I have been able to secure wants pls. xix. to xxvi.

Lumbriconereis punctata, n. sp. (Pl. XXX. fig. 9; Pl. XVIIIA. fig. 11).

Habitat.—Dredged at Station 45 (off the American coast, near New York), May 3, 1873; lat. 38° 34′ N., long. 72° 10′ W.; depth, 1240 fathoms; bottom temperature 37°·2, surface temperature 49°·5; sea-bottom, blue mud.

A fragmentary specimen, measuring about 20 mm. in length and about 2 mm. in breadth.

The general aspect of the animal differs from that of *Lumbriconereis fragilis* in having much longer bristles and a more pointed snout. Besides the acuteness of the latter (Pl. XXX. fig. 9), a further characteristic is the presence of about six brown pigment-spots symmetrically arranged, three on each side of the middle line, toward the posterior border of the head. Moreover, on the ventral surface a conspicuous dark pigment-speck exists in each of the anterior oral folds. The dorsal pigment-specks in the preparation are hardly so distinct as eye-specks, and may be the remnants of pigment-streaks. The head both dorsally and ventrally is marked by longitudinal streaks.

The maxillæ (Fig. 19) have a marked constriction in front of the posterior spathulate processes, each of which is almost semicircular. The left great dental plate shows only two large teeth; the right has a terminal tooth, and posteriorly, after an interval, two others, besides an elevated ridge following the latter. The lateral plate immediately in front is wedge-shaped, with a single tooth. The anterior plate is somewhat rhomboidal, with a single black tooth next that of the adjoining plate. There is no sinus next the tooth, and apparently no accessory plate. The ventral dentary surface of the mandibles is similar to that in the foregoing species, but more acute externally. There are three teeth on the anterior margin on each side of the middle line, besides an elevated ridge externally.

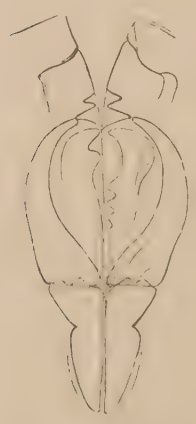


FIG. 19.—Maxillæ and dental plates of *Lumbriconereis punctata*, from the dorsal surface; × 90 diameters.

The shape of the soft parts of the feet does not differ in a material manner from those of *Lumbriconereis fragilis*, except, perhaps, in being a little more produced. The bristles and hooks, however, are much longer throughout. At the tenth foot the posterior lobe is more pointed than in the common species, resembling in this respect *Lumbriconereis abyssorum*. The bristles are pale, more slender, and less numerous than in *Lumbriconereis fragilis*, and the spines are not black. At the thirtieth foot, again, the long dorsal bristles far exceed in length those of the species just mentioned, and the wings in the longest are rudimentary.

At the fiftieth foot the American form still has two attenuate bristles below the elongate superior one, and the hooks are more slender, and differ in the character of their serrations at the tip, from those of *Lumbriconereis fragilis*. The curvature at

the extremity also diverges in each case. The bristles are continued amongst the hooks to the posterior end of the fragment. The posterior hooks (Pl. XVIIIA. fig. 11) decidedly differ in size, curves, serrations, and other points from those of *Lumbriconereis fragilis*. The spines are also pale throughout.

In transverse section the body-wall of this species somewhat corresponds with *Lumbriconereis abyssorum*, having a comparatively large nerve-area, with a short and wide pedicle, while no neural canal is visible in the preparation. In the intestine are peculiar pear-shaped bladder-like structures with parallel granular folds. These may be either parasitic bodies or introduced with the food, probably the former.

At first it appeared as if this form was only a variety of the common *Lumbriconereis fragilis*, but a consideration of all the points in its structure shows the desirability of separation. Verrill describes a species (*Lumbriconereis opalina* [1]) with four eyes, and similar feet, but as he does not go into the anatomy of the dental apparatus or the bristles their relationship is uncertain.

Lumbriconereis ehlersii, n. sp., var. *tenuisetis* (Pl. XXXVII. fig. 9; Pl. XVIIIA. fig. 12).

Habitat.—Dredged at Station 47 (off the American coast, midway between New York and Halifax), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; surface temperature, 42°·0; sea-bottom, blue mud.

Like the rest this form is fragmentary, but it is larger than several of the foregoing, measuring about 48 mm. in length and about 3·5 mm. in breadth anteriorly.

It has much of the facies of *Lumbriconereis fragilis*, and as we are at present in doubt concerning the sexual and other variations, especially in regard to any change occurring in the form of the bristles in the respective sexes, some dubiety remains in connection with the subject.

The head (Pl. XXXVII. fig. 9) is less acutely conical than in *Lumbriconereis fragilis*, and is marked on the dorsum by numerous longitudinal pigment-streaks. These attain their maximum posteriorly, but yet do not show the distinct specks characteristic of the head of the previous species. There are also a few longitudinal streaks on the ventral surface, but no specks exist on the labial folds. No grooves occur on the snout, either dorsally or ventrally.

The dental apparatus is dark brown, the maxillary region being large in proportion to the space occupied by the great dental plates (Figs. 20 and 22), the horny parts of which are small. The spathulate posterior region of the maxillæ tapers distally. The left great dental plate has five teeth, the right five. Both lateral (anterior) plates are

[1] Report of U.S. Fish Commission, Invert. An. of Vineyard Sound, p. 594.

wedge-shaped, the smaller terminating in a somewhat blunt tooth, the larger in a sharper tooth, and outside this is a ridge continued into a small accessory plate. The ventral surface of the dentary region of the mandibles (Fig. 21) is crescentic, with very distinct blackish lines from the pigment-patch at the outer edge of each. A large tooth exists on each side of the middle line anteriorly, besides a minute denticulation or two inside the pigment-patch.

The shape of the soft parts of the feet much resembles that in *Lumbriconereis fragilis*, but the bristles are considerably longer. At the tenth foot there is little difference between the outline of the parts and that in *Lumbriconereis ehlersii*, from the "Valorous" dredgings. The bristles are also similar, consisting of superior winged bristles of moderate length, and of inferior winged hooks with long tips.

At the thirtieth foot, however, the present species has much longer bristles than the other; but a comparison of the hooks is not attainable, since all had been removed from the American form.

In the posterior region a decided divergence occurs in the shape of the foot, which is

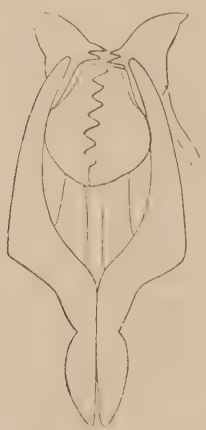


Fig. 20.

Fig. 21.

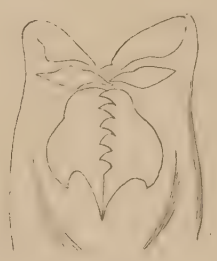


Fig. 22.

FIG. 20.—Maxillæ and dental plates of *Lumbriconereis ehlersii*, from the dorsal aspect; × 15 diameters.
FIG. 21.—Dental plates of *Lumbriconereis ehlersii*, from the ventral surface; × 15 diameters.
FIG. 22.—Mandibles of *Lumbriconereis ehlersii*, from the ventral aspect; × 15 diameters.

more pointed in the present form. The hooks (Pl. XVIIIA. fig. 12) have a shorter wing and a more pronounced curve at the neck.

In transverse section the body-wall shows a thick hypodermic coat, and a strong circular layer beneath. The pedicle of the nerve-area is somewhat broad, and the neural canal large. Traces of a minute canal are visible in some preparations below the foregoing. The alimentary tract has anteriorly very conspicuous longitudinal folds or ridges.

This appears to be a variety of the European species which I have called *Lumbriconereis ehlersii*, and which was also found during the "Valorous" Expedition on the shores of Greenland.

Lumbriconereis heteropoda, Marenzeller (Pl. XXXVII. figs. 1, 2; Pl. XVIIIa. figs. 13, 14).

Lumbriconereis heteropoda, Marenzeller, Denkschr. d. k. Akad. d. Wiss. Wien, Bd. xli., sep. Abd. p. 30, Taf. v. fig. 4, and Taf. vi. fig. 1.

Habitat.—Dredged off Yokohama, Japan, in 5 to 25 fathoms, May 6, 1875; and off Kobé, Japan, May 17 to 19, 1875; depth, 3 to 50 fathoms.

A fragmentary though very large *Lumbriconereis*, the most complete example (from Yokohama) measuring about 210 mm. in length, and having a diameter of about 6 mm. across the body and feet at the anterior third.

The body is slightly tapered anteriorly, remains about the same breadth for a considerable distance, and then gradually tapers to the tail (which, however, is absent). The feet appear to increase in length from before backward. The segments are well-marked throughout, and in the preparation have a prominent dorsal ridge. Traces of pigment, in the form of a slight bar across each segment, occur anteriorly.

The head (Pl. XXXVII. fig. 1) forms a short blunt cone, almost semicircular in outline. Dorsally, some pigment granules exist along the posterior border, and also a few longitudinal wrinkles, one on each side being deeper. No eyes are seen until the snout is bent downward, so as to expose the segment-junction. A pair of eyes then appear in front of the semicircular notch in the centre of the buccal segment. On each side of the notch just alluded to a region of the snout is cut off by a fold, the little area thus circumscribed indicating, perhaps, the lobe which is distinct in *Lumbriconereis* (*Zygolobus*), Grube. In this case, however, the areas are wide apart. The under surface of the snout has a well-marked lateral wrinkle, and there are two bars of dark pigment-granules at the posterior border, just in front of the mouth, both, indeed, being partially covered by the very large anterior oral folds. The latter are also slightly flecked with pigment.

In this large species the whole dental apparatus is of a deep blackish-brown. The maxillæ (Fig. 24) do not exhibit so marked an elevation at the base as is usually present in the series, and thus the anterior and posterior curves (downward) are not so conspicuous. The posterior processes are remarkable for their great length and acutely pointed condition. Each great dental plate has four teeth; moreover, the somewhat triangular horny region behind the dentary is marked off by a deep suture. The usual proportion between the two anterior plates does not hold, that nearest the great dental plate being only a little less than the anterior, and of a somewhat crescentic shape, terminating in an inner dental region, which is distinguished from the outer, furnished with two teeth—an anterior prominent one and a posterior smaller process. The anterior plate is irregularly triangular, with a long tooth internally. Near the latter (tooth) is an accessory isolated plate, and the ordinary thin horny bar running backward to the maxilla. The ventral dentary

surface of the mandibles (Fig. 25) presents the aspect of a bivalve shell (*e.g.*, *Tellina*), only the hinge is posterior. It is deeply coloured with blackish pigment, and veined. The halves of the mandibles do not seem to have been ankylosed. Three characteristically symmetrical horny plates (two lateral and great dental) are visible on each side of the ventral surface (Fig. 23), and the angles of the posterior (great dental) are distinct.

As usual in the group, the first two segments (buccal) are bare. The anterior feet are small, but, as mentioned, gradually increase in size from before backward. At the tenth foot the posterior lobe is proportionally large, slanting from its somewhat straight upper border abruptly downward and inward. Only the upper bristles remain, and they are winged, with rather elongated tapering tips. There is a slight indication of a dorsal papilla, but it does not attain a noteworthy size.

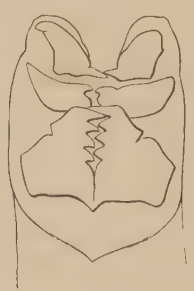


Fig. 23.

Fig. 24.

Fig. 25.

Fig. 23.—Maxillæ and dental plates of *Lumbriconereis heteropoda*, from the dorsum ; × 12 diameters.
Fig. 24.—Dental plates of *Lumbriconereis heteropoda*, from the ventral surface ; × 12 diameters.
Fig. 25.—Mandibles of *Lumbriconereis heteropoda*, from the dorsal aspect ; × 12 diameters.

At the thirtieth foot the posterior lobe more nearly approaches the anterior in size, and the bristles pass out between them. The anterior is rounded dorsally, whereas the posterior forms an angle a little less than a right angle superiorly. The bristles are in about four groups, the upper having the longest, and the third the shortest tips. All have wings. On the dorsum near the base of the foot is a very distinct papilla (Pl. XXXVII. fig. 2).

The fiftieth foot is similar to the foregoing, except that the tips of the bristles are shorter, and that a few hooks have appeared amongst them. Toward the eightieth foot the posterior lobe becomes greatly developed superiorly, so as to have a considerable triangular area elevated above the foot. A single group of two or three slender bristles, reaching very little beyond the tips of the hooks (the second group from above), alone

remains, the rest being the strong winged hooks characteristic of the species. The dorsal papilla is very evident. Little change takes place in the succeeding feet, so far as they are present.

In the larger fragmentary example from Kobé, the dorsal papilla is very boldly marked, and may indicate a connecting link with *Notocirrus* while the bristles of *Lumbriconereis* are retained. The size of this specimen enables the structure of the posterior bristles to be readily observed. Dorsally each foot has a stout winged hook, then a group of three bristles (Pl. XVIIIA. fig. 14) with much more slender shafts than the foregoing, and comparatively short, winged, and tapering tips, which reach only a little beyond the first hook. Four or more winged hooks (Pl. XVIIIA. fig. 13, an average example) of the same type as the dorsal then follow, the tips being somewhat shorter than in the latter.

In transverse section the hypoderm is fairly developed throughout, and is thickest laterally toward the bases of the feet. The circular muscular coat is strongly marked, a kind of raphe occurring in the median line ventrally by the entrance of cross-fibres from the oblique muscles, and connective tissue. The decussation of the oblique fibres below the nerve-area is unusually distinct, so as to form a powerful muscular pillar at the part for the support of the cords, which lie in the upper angle. In section the nerve-area is more ovoid than usual, the large superior canal occupying the middle third, and a small neural canal being in the median line inferiorly. The great vascularity of all the tissues in this species, except the hypoderm and cuticle, is conspicuous.

This form appears to be so closely allied to Marenzeller's *Lumbriconereis heteropoda* from the Bay of Miya, in Southern Japan, that separation has been deemed unnecessary. The general form of the maxillæ and dental plates is similar, though the curves at the bases of the former are more gentle in the example procured by the Challenger. The posterior hooks are identical. The posterior lobe of the foot is more elevated than in Marenzeller's figure, and the head is somewhat shorter, but these differences may be due to the mode of preparation followed in each.

Palolo, J. E. Gray.

Palolo viridis, Gray (Pl. XVIIIA. figs. 20, 21).

"The Fiji worm, appearing in quantities at certain times of the year."

The above is all the information concerning the fragments in the Challenger collection. They had been imperfectly preserved, being covered with a mouldy crust and softened.

The bristles (Pl. XVIIIA. fig. 20, from a male) quite differ from Dr. Macdonald's representation. The shaft is comparatively stout, and the terminal region is marked

by a distinct enlargement posteriorly, the tip then diminishing to a very delicate point. The edge of the extremity on the ventral aspect (that is, on the side opposite the enlargement) is roughened by fine serrations. The twist described by Dr. Macdonald is probably due to position, and the more slender ones certainly simulate this condition.

The hooks again (Pl. XVIIIA. fig. 21) diverge from Dr. Macdonald's in regard to the comparative length of the terminal region, so that in all probability his bristle was from the anterior region of the body, where the terminal region is longer.

In transverse sections of specimens from Samoa, kindly procured for me some years ago by Prof. Busk, the body-wall in both males and females is largely distended with the reproductive elements. In the males a line of dark brownish pigment runs inside the muscular layers, thus surrounding the mass of sperm-cells or spermatozoa which fills up the entire cavity. The alimentary canal is atrophied, and forms a median vertical streak. The nerve-area is ovoid and comparatively large, no neural canal being evident, though it must be remembered that the preservation of the preparations is indifferent. The oblique fibres pass down by the sides of the cords, and a band on each side goes upward to the alimentary canal, apparently enclosing the vessel.

In the female the stretching of the layers of the body-wall is equally conspicuous, but no layer of pigment occurs internally. The nerve-cords, however, have externally a deep blackish-brown band. The ova are large and greenish.

The first scientific account of the *Palolo* is that of Dr. Gray, who communicated his remarks to the Zoological Society of London in February 1847. His description was drawn up from numerous specimens (all headless and incomplete) presented to the British Museum by the Rev. J. B. Stair. Dr. Gray considered it allied to *Arenicola* (which it really diverges from). He described it as *Palola*[1]—"Body cylindrical, separated into equal joints, each joint with a small tuft of three or four spicula on the middle of each side. Head? Last joint ending in a couple of tentacles. Eyes globular.

"*Palola viridis*, n. sp.

"Green with a row of round black spots down the middle of the dorsal (?) surface; one spot on the middle of each joint.

"*Habitat*.—Navigator Islands."

In forwarding the specimens from Samoa, Mr. Stair stated that the Annelids appear regularly in the months of October and November, during portions of two days in each month, viz., the day before and the day on which the moon is in her last quarter. They occur in much greater numbers on the second than on the first day of their rising, and are only observed for two or three hours in the early morning. At the dawn of day they may be felt by the hand swimming on the surface of the water; and as the day advances their numbers increase, so that by the time the sun has risen thousands may be

[1] *Ann. and Mag. Nat. Hist.*, vol. xix. p. 409, 1847.

observed in a very small space. The second day they appear at the same time, and in a similar manner, but in such countless myriads that the surface of the ocean is covered with them for a considerable extent. Each day, after sporting for an hour or two, they disappear until the next season, and none are observed in the interval. Mr. Stair was of opinion that they came from the coral-reefs, and added that the natives caught them in small baskets, beautifully made, tied them up in leaves, and baked them. Great quantities, moreover, were eaten undressed. They are esteemed a great delicacy by the natives, and the moment the fishing parties reach the shore messengers are despatched with them to those parts of the island unvisited by the *Palolo*.

Dr. J. D. Macdonald was the next author who reported on the *Palolo*,[1] while surveying in H.M.S. "Herald" in the South-western Pacific. He examined considerable numbers in the Fiji group and at Samoa, and fortunately found a head, though at first he experienced the same difficulty as Dr. Gray. He points out that the Fijian name for the animal is "Mbalolo," and that the great antiquity of the latter is evident from the fact that the parts of the year nearly corresponding with October and November are respectively termed "Mbalolo lailai" (little) and "Mbalolo levu" (large). The latter is distinguished by the appearance of multitudes of the *Palolo*, which is often forwarded by certain chiefs to others whose small dominions do not happen to be visited by the Annelid. Dr. Macdonald thought that the frequent rupture of the body was connected with the reproduction of the species.

One of the most important points in the interesting paper of this author is the description (and figure) of the head, which shows a bilobed snout somewhat as in *Lysidice*, a median longer and two adjoining shorter lateral tentacles. On each side is a comparatively large eye. The armature of the buccal region is also carefully described and figured, and still more clearly demonstrates its relationship with the Eunicidæ, not with the Nereidæ as Dr. Macdonald supposed. Fair representations of the hooks and bristles as well as the structure of the feet are given, and also the condition of the posterior end.

In the Catalogue of the Fauna of St. Andrews (early in 1875) I mentioned under the general remarks on the Annelida[2] that if the *Palolo* has similar habits to the *Lysidice* of our southern coasts (that is, dwells in fissures and crevices of the rocks at and near low water), it probably leaves its retreats for the purpose of depositing ova.

The Rev. S. J. Whitmee of Samoa had previously forwarded specimens of the *Palolo* to Dr. Sclater along with a number of very interesting observations with regard to its habits and dates of appearance.[3] He found a specimen in a dead coral block removed from the sea, near a spot frequented by the *Palolo*; and he observed vast numbers at the

[1] *Trans. Linn. Soc. Lond.*, vol. xxii. p. 237, pl. xli., 1858.
[2] Page 102 (and previously in the *Ann. and Mag. Nat. Hist.* for August 1874).
[3] *Proc. Zool. Soc. Lond.*, 1875, p. 496.

edge of the reef, in about 2 fathoms of water, entangled in an inextricable mass. Where they have freedom they move through the water in a spiral manner. He describes the males as light brown (buff ?) and the females as green, and mentions that both sexes rapidly break up in the sea, "by a natural process by which the species is propagated." Specimens which he kept in an aquarium also broke in pieces, and he did not succeed in rearing the ova. His statistics in regard to the appearance of the *Palolo* are both numerous and valuable.[1]

Lately further observations on the *Palolo* have been made by the Rev. T. Powell, of Samoa.[2] He gives the length as from 1 to 20 inches, and the diameter from $\frac{1}{10}$ to $\frac{1}{4}$ of an inch, so that the form must sometimes attain a very considerable size. Those hitherto sent to this country are small. There are four shades, viz., white, light brown or ochre, greyish indigo, and dark green; the two former colours being males, the latter females. He remarks that the setæ in some move with great rapidity in all directions like "the cilia of a rotifer," a somewhat striking comparison. He made the interesting observation that it is not necessary for the *Palolo* to break up to discharge its reproductive elements, for several complete forms sent out streams of ova and spermatozoa through what he terms the oviducts and seminal ducts "which extend on each side from the centre of the back, between each pair of somites, and terminate on the under side between each pair of lateral appendages." Moreover, he caught many on the *Palolo*-ground almost free from sexual elements, and yet entire as regards their segments.

The *Palolo* moves through the water in a serpentine manner, but in rising from the bottom it assumes a somewhat spiral form. This author also notices the acute sight of the Annelids and their activity in escaping capture. An observation he makes about the tail being furnished with a "disk or the power of forming itself into one" is obscure, though he probably means that the anus is suctorial, for no special apparatus of this nature is apparent, and it certainly does not require such to hold on to its tube in the coral, for it is provided with a far more efficient method.

Mr. Powell observes that the natives are generally correct in predicting the appearance of the *Palolo*, taking, as an indication of the approach of the season, the appearance

[1] In the collection of the British Museum are several specimens presented by W. Wykeham Perry, Esq., in 1875, from Mota Island, New Hebrides, and of which it is recorded that "I found these Annelids on the coral beach at Mota. They were plentiful, though difficult to find, or rather get out of the holes in the coral, to which they adhered with their legs. They present every resemblance to *Palolo*. The natives call them A'oon, and say they eat them. I succeeded in getting three or four entire specimens from the coral-rock left exposed at low water." The specimens referred to are long dark bluish-green Phyllodocidæ, with beautiful iridescent tints. The head has four lobate tentacular cirri at the tip of the snout, three lobate tentacular cirri laterally on each side, and a more slender one dorsally, behind and to the inner side of each upper process. The body is nearly 13 inches in length, and not thicker than *Palolo*. The under surface is dusky green, while the lobate processes of the head are light brown, and the two slender cirri of a dull greenish colour, like the appendages of the feet. The tail is terminated by two short processes. The specimens appeared to resemble each other closely, and external examination revealed no sexual products.

[2] *Proc. Linn. Soc. Lond.*, vol. xvi. p. 393, 1882.

of the scarlet flowers of *Erythrina indica*. When, finally, the "Seasea" (*Eugenia*) is in bloom, the men look out for the moon's being just above the western horizon at the dawn of day, and on the tenth morning the *Palolo* appears. The extra lunar month, however, occasionally misleads them. There is a second appearance of the *Palolo*, a month after the first, probably consisting, he says, of those that are not sufficiently mature to spawn in October, or, perhaps, another species.

Family Eunicidæ.

The representatives of this family are comparatively numerous in the Challenger series; indeed, though apparently more plentiful in the warmer seas, they occur in most oceans, from the extreme north through the temperate and tropical seas to the extreme south. A large number accordingly, arranged under five genera, are described by Kinberg in his Freg. Eugen. Resa; and Grube presents fourteen from the Philippines. Schmarda gives an account of nine in his Neue wirbell. Thiere, but his woodcuts of the minute structure are somewhat indefinite, and it is thus difficult to recognize the species. Only five are indicated by Prof. Grube in the collection of the German exploring ship "Gazelle." Ehlers found no less than thirty-four in the Annelids procured by Alexander Agassiz in the "Blake," and he considered them the most important group in the collection.[1]

The Eunicidæ are discriminated in spirit by their general form, the structure of the dental apparatus, branchiæ, feet, and bristles. Considerable variety occurs in the structure of the dental apparatus, even in the same species, and this is not always due to sexual distinction. It must also be borne in mind that changes in outline as well as in colour ensue as age advances. Moreover, the number of teeth in the lateral and great dental plates is not always the same. Schmarda, Kinberg, and Ehlers place considerable reliance on the dental characters, but Grube, while coinciding with them, also points out that there is variation both in these and in the branches of the branchiæ. On the whole the species are less easily defined than usual in the group, and much yet remains to be done in synonymy. It is hoped, however, that the accompanying structural figures and descriptions will obviate some of the difficulties of subsequent observers.

The examples procured by the Challenger have, as a rule, lost their tubes. *Eunice magellanica*, however, presents a tendency to branching in its tube, and it is possible that such foreign examples may be connected with the branched tubes found in sponges and elsewhere. Grube found *Eunice siciliensis* in tubes in the limestone of Quarnero.

The species range from shallow water to 1240 fathoms. Their food is varied,

[1] *Bull. Mus. Comp. Zoöl.*, vol. v., Nos. 11 to 14, p. 273.

consisting of Algæ, minute Crustacea, Polyzoa, Sponges, Foraminifera, and sandy mud containing numerous minute organisms.

Parasites are rare in this family.

The notion that the Eunicidæ bore into telegraph-cables has been promulgated by so careful an observer as Mr. C. Stewart,[1] now Conservator of the Museum of the Royal College of Surgeons of England. He says, speaking of the so-called *Lithognatha worslei*, that he has not been able to find a description of any (Annelid ?) having calcareous jaws, and therefore "this feature seems to me so important as to justify a distinct genus being made for it." In this connection, however, it may be stated that it would be very difficult to find any representative of the families of the Eunicidæ, Lumbrinereidæ, Onuphididæ, and others without such dental armature. Further, his having concluded that because it was the only form having calcareous jaws brought up with the cable off Singapore, it must have been the borer, is not altogether warranted. It is more likely that the species, like *Nereis pelagica*, and others under the same circumstances, simply took possession of the tube of a true borer (if it really occurred in it), and that its calcareous jaws had no connection with the making of that perforation.

Nematonereis, Schmarda.

Nematonereis schmardæ, n. sp. (Pl. XXXVII. figs. 6, 7, 8 ; Pl. XVIIIA. figs. 16–19).

Habitat.—Dredged at Station 122 (off Barra Grande, a little south of Pernambuco, on the coast of Brazil), September 10, 1873 ; lat. 9° 5′ S., long. 34° 50′ W. ; depth, 350 fathoms ; surface temperature, 77°·5 ; sea-bottom, red mud.

A small form, measuring in its fragmentary condition about 18 mm. in length and a little more than 1 mm. in breadth.

The body is slightly diminished in front, and the segments, with the exception of the first two, are narrower anterior to a line passing transversely at 12 mm. from the snout than posterior to it.

The head (Pl. XXXVII. fig. 6) agrees with that of Schmarda's *Nematonereis unicornis* in regard to shape and position of the eyes (except that these are more distinctly lateral in the present form) ; but as the tentacle is only represented by a fragment of its base, comparison in this case is lost. The under surface of the snout presents a deep median groove.

The dental apparatus of this form approaches that of the Eunicidæ. The maxillæ (Fig. 26) have a broad base, and taper to a blunt and somewhat abruptly curved point. As in other organs of the same kind the basal region is hollow, and the horny investment increases in thickness toward the tip. The left great dental plate has five or six

[1] *Journ. Roy. Micr. Soc.*, ser. 2, vol. ii. pp. 717–719, pl. ix., 1881.

teeth ; the right six. The left lateral paired plate has about five teeth, and an accessory plate with a blunt tooth at the outer end. The left lateral unpaired plate appears to have six or seven teeth, but its position in the preparation makes the description uncertain. The right lateral has seven or eight teeth. The spathulate processes posteriorly are broad and comparatively blunt at the end. The mandibles (Fig. 27) have long slender shafts and ovoid dentary surfaces.

Fig. 26.

Fig. 27.

Fig. 26.—Maxillæ and dental plates of *Nematonereis schmardæ* ; × 55 diameters.
Fig. 27.—Mandible of *Nematonereis schmardæ* ; × 55 diameters.

The first foot is well developed, and has both a dorsal and a ventral cirrus. The tenth shows a stout dorsal cirrus, placed near the base of the foot; then the setigerous lobe with its brownish spines, bearing superiorly a series of simple tapering and brittle bristles with narrow wings, followed inferiorly by the compound forms. The tips of the latter are boldly bifid, and the articulation, with the dilated end of the shaft, is clearly defined. The inferior cirri of the anterior region of the body quite diverge from their successors, and, indeed, give a character to the part. This ventral lobe or enlarged cirrus forms a rounded terminal mass, best marked from the third to the thirteenth segments, though it is present from the first to about the seventeenth foot.

At the thirtieth foot (Pl. XXXVII. fig. 7) the small ventral cirrus (which is somewhat cylindrical) is well formed, and continues to the posterior end of the fragmentary specimen. The simple bristles (Pl. XVIIIA. fig. 16) are longer and more slender than in the tenth foot, and show narrow wings. The dorsal cirrus is somewhat fusiform, narrow at the base and tapering at the tip. The points of the brownish spines project beyond the soft part of the foot, but there is no differentiation of the extremities as posteriorly. One or two translucent brush-like bristles occur superiorly. The curvature of the compound bristles (Pl. XVIIIA. fig. 17) is peculiar.

At the fiftieth foot the upper, and stronger, brownish spine (Pl. XVIIIA. fig. 18) shows indications of a curiously hooked tip with a chitinous guard or wing. This feature is still more distinctly marked in the posterior segments ; the arrangement of the other parts, however, being similar (Pl. XXXVII. fig. 8), as, for instance, the structure of the brush-shaped bristles (Pl. XVIIIA. fig. 19). A pigment-spot appears posteriorly at the base of each foot, at the origin of the dorsal cirrus. In the anterior region of the body this spot occurs near the tip of the setigerous process.

The specimen is a male, the body-cavity being distended with sperm-cells. The united nerve-cords are large and rounded, and no sign of a neural canal occurs. The greater part of the cord projects freely into the perivisceral cavity.

The structure of the dental apparatus of this genus, as Ehlers[1] clearly points out, leans to the type of the Eunicidæ, and diverges from that in the Lumbrinereidæ. The present species approaches the *Nematonereis unicornis* of Schmarda[2] somewhat closely, but the condition of his figures, and the want of definition in his description leave no course except separation open, until, for instance, the discrepancies of the maxillæ and dental plates are explained.

Nematonereis, sp. (Pl. XXXVII. fig. 10; Pl. XIXA. figs. 1, 2).

Habitat.—Found on the beach between tide-marks at Sea Point, near Cape Town.

A fragment, apparently consisting of the tail of a member of the present group.

The segments of the body are marked with great distinctness, the junctions forming deep depressions, wide at the anterior part of the fragment, and narrow behind. Each foot (Pl. XXXVII. fig. 10) bears dorsally a small cirrus, which hardly projects beyond the line of the setigerous region. Inferiorly is a minute ventral cirrus, which, as usual, is proportionally more massive than the upper. Superiorly are a series of elongated tapering bristles without an evident wing, and a number of short brush-shaped forms (Pl. XIXA. fig. 1) characterised by their comparatively large and broad tips. Inferiorly are jointed bristles (Pl. XIXA. fig. 2) with short terminal pieces, showing a bifid terminal fang and a large one beneath, while the end of the shaft is dilated. In addition the foot bears an attenuate brownish spine, and a long brownish bifid hook, with a short terminal and a larger subjacent fang.

This fragment appears to be most closely related to the foregoing.

Nematonereis, sp. (Pl. XXXVII. fig. 11; Pl. XIXA. figs. 3–5).

Habitat.—Procured at St. Vincent, Cape Verde Islands, July 1873, probably on shore, though this is not stated.

A fragment of the posterior end of a form allied to the foregoing. The segments of the specimen are as distinctly marked as in the posterior end of *Lysidice ninetta*, and it is about the same size as an average example of the latter.

The foot (Pl. XXXVII. fig. 11) has dorsally a minute cirrus, which does not project so far outward as a vertical line touched by the tip of the setigerous region. The latter is somewhat (though irregularly) conical, with the brownish spine projecting through the apex. Inferiorly is a thick lobate ventral cirrus, which (from the shorter inferior line of the setigerous lobe) projects further outward than the dorsal cirrus.

[1] Die Borstenwürmer, ii. p. 373.

[2] Neue wirbell. Thiere, I. ii. p. 119, Taf. xxxii. fig. 254.

Superiorly is a series of simple tapering bristles, having a well-marked curve at the commencement of the wing, which is distinctly serrated. The brush-like forms present a narrower tip than in the foregoing, though still of considerable breadth (Pl. XIXA. fig. 3), and the spikes have a different arrangement at the sides. The jointed inferior series show a curved terminal hook, and a secondary one about the same length, set at a right angle (Pl. XIXA. fig. 4). The dilatation of the tip of the shaft is pronounced, and both sides are serrated. In addition to the brownish spine is a single long pale brownish hook (Pl. XIXA. fig. 5, which represents a complete example).

So far as can be observed, this form agrees in most respects with the two species just mentioned.

Eunice, Cuvier.

Eunice magellanica, n. sp. (Pl. XXXVII. figs. 12–15; Pl. XIXA. figs. 6–9).

" *Habitat.*—Trawled at Station 308 (in the Strait of Magellan), January 5, 1876; lat. 50° 8′ 30″ S., long. 74° 41′ W.; depth, 175 fathoms; surface temperature, 51°·7; sea-bottom, blue mud. Also in the same Strait at Station 311, January 11, 1876; lat. 52° 45′ 30″ S., long. 73° 46′ W.; depth, 245 fathoms; bottom temperature, 46°; surface temperature, 50°; sea-bottom, blue mud.

This species is of considerable size, average examples measuring 160 mm. in length and about 10 mm. in breadth at the widest part.

The body in all is rounded anteriorly, from the proboscidian enlargement, but flattened from above downward throughout the rest of its extent. A considerable portion in front remains nearly of the same diameter, but thereafter a gradual diminution occurs toward the tail.

The head (Pl. XXXVII. fig. 12) has the usual bilobed condition characteristic of the group, and the three dorsal processes are of considerable length. The largest and longest is the tentacle, which is more than three times the antero-posterior diameter of the buccal segment. Like the rest of the processes it is articulated at intervals. The antennæ are only a little shorter. In none are these organs delicately tapered; indeed, in several they seem to be in process of regeneration, being blunt and short. The outer tentacles are about half the length of the foregoing, often less. Their articulations are distinct. The tentacular cirri, which are similarly jointed, spring from the anterior border of the buccal segment, and their tips just reach its anterior margin. An eye of considerable size is situated on a little eminence running backward from the base of the outer tentacle. It has no "lens." The organ is only visible in the preparation on folding the nuchal collar backward. The frontal lobes are well marked. The buccal

segment is rather more than the breadth of the next three, has a well-defined sinus inferiorly, and a notch laterally at the projecting lip. In one instance, just below the latter, an isolated process, like a rudimentary palpus, appeared. This is an abnormality.

The maxillæ (Pl. XXXVII. fig. 13) present a well-defined outward curve, and there is no abrupt bend at the tip. The left great dental plate has six, and the right seven teeth. The left lateral paired plate (that continuous with the two terminal or accessory plates) has four teeth, the unpaired has seven. The right lateral plate has nine teeth. The mandible (Pl. XXXVII. fig. 14) is composed of two elongated, flattened pieces, somewhat clavate in outline, the tips being produced externally, and provided with an irregular cutting edge.

The first five segments behind the buccal bear simple feet. Dorsally each has a cirrus, articulated in a similar manner to the tentacle, and of moderate length, a median setigerous region, and a well-marked ventral cirrus, which is largest and longest (so far as these five are concerned) in the first. The sixth foot bears a minute, simple, branchial process near the base of its dorsal cirrus, in one example, and none on the seventh or eighth. In others a branchia with several branches appears on the seventh foot; while in a few the tuft appears on the eighth. There is, therefore, considerable variety in regard to the commencement of these processes. Wherever it commences the tuft soon gains a number of divisions (five or six), which are proportionally of considerable length, though the whole organ is by no means conspicuous. As an illustration, in one example the branchia of the tenth foot had eight divisions; that on the twentieth (Pl. XXXVII. fig. 15) nine, one being bifid; on the thirtieth foot nine; on the fortieth seven; on the fiftieth five; on the fifty-sixth six; on the seventieth six; on the ninetieth twelve, and an additional (second) branchia at the base with five processes. The branchiæ posteriorly acquire a decided increase in size, and instead of the pectinate form which characterises them anteriorly, their shape rather approaches that of an arbuscle. So far as the specimens show the branchiæ are continued to the tail, only a few of the rudimentary posterior segments being devoid of them.

The dorsal cirri are of average length, and present the same articulations as the cephalic processes, the only noteworthy change being their comparative slenderness and length posteriorly. The ventral cirrus soon forms a disk-like elevation or pad anteriorly, with a short terminal process, and such continues throughout the greater part of the body. Toward the tail, however, the disk-like structure disappears, and the organs assume the form of thickish cirri. The disk-like projection is probably of service to the animal (as a suctorial arrangement) in its tube, to which several members of the group cling tenaciously.

The anterior feet have three black spines, often slightly curved at the tip. Each foot further has a series of somewhat short simple bristles (Pl. XIXA. fig. 6) with a

slight wing, and a number of brush-shaped forms (Pl. XIXA. fig. 7), one lateral filament being generally longer than the others. Beneath the spines are the compound bristles, each having a stout slightly curved shaft, with a dilatation and an obliquity at the free end (Pl. XIXA. fig. 8), the convex edge, moreover, being minutely serrated, and furnished with a terminal bifid portion protected by a guard.

About the thirtieth foot another black spine is introduced inferiorly, and continues to the posterior end of the body. It has a bifid tip, a small process occurring on the crown, and a much larger one forming a hook beneath (Pl. XIXA. fig. 9). The bifid tip, which on the whole is slightly developed, is guarded by a pair of short wings.

The tail is terminated by two tapering styles of considerable length, and articulated as in the frontal processes.

The specimens are somewhat numerous, and are accompanied by tough parchment-like cases,[1] which seem to have been formed amongst zoophytes, after the manner of those of *Thelepus* on our own shores. The tubes, moreover, are slightly branched. This branching is more distinctly seen in what appears to be a similar tube (Fig. 28) kindly forwarded by Mr. H. J. Carter from the Gulf of Manaar. In this case the tube grows amongst the branches of a horny sponge (*Hircinia clathrata*), resembling a coarse officinal one.

Fig. 28.—Tube, probably of an *Eunice*, attached to a sponge (*Hircinia clathrata*, H. J. Carter), Gulf of Manaar.

The intestine is filled posteriorly with pellets of a dull greenish substance, amongst which are many sponge-spicules, fragments of perforated calcareous plates, pieces of a minute calcareous tube, and other debris.

In transverse section the body-wall in the main agrees with *Eunice torquata*, De Quatrefages. The longitudinal ventral muscles, however, are less bulky internally. The strong oblique muscles pass to the ventral border of the nerve-area and curve outward within the circular muscular coat, which as usual extends continuously across the region. The nerve-area appears like an investment of the large neural canal; while superiorly an opaque brownish granular mass occurs above the nerve-cords. The longitudinal dorsal muscles (which are about the same size as the ventral) are massive inferiorly, but diminish towards the median dorsal line.

Eunice magellanica, n. sp. (young ?).

Habitat.—Dredged at Station 149 (Accessible Bay, Kerguelen); lat. 49° 8′ S., long. 70° 12′ E.; depth, 20 fathoms; sea-bottom, volcanic mud.

[1] Like those of *Eunice floridana* of Ehlers, *Bull. Mus. Comp. Zoöl.*, vol. v., No. 12, p. 273.

This specimen, probably the young of the former species, measures about 15 mm. in length, and the extreme breadth anteriorly (including bristles) is about 1·5 mm.

The front of the head is only notched, not deeply cleft into lobes. The tentacles are rather short, and distinctly marked by translucent articulations, at considerable intervals. The tentacular cirri do not reach the anterior margin of the buccal segment. The black eyes are large, and have their usual position.

The branchiæ commence as a simple filament on the sixth foot, show two branches on the fifteenth, but only one or two of the latter kind occur, the rest having the simple branchial process. They continue to the posterior end of the specimen (which, however, is incomplete), or to the fifty-second segment. The branchial process seems to be about the length of the cirrus.

The tenth foot shows two stoutish brown spines, a well-marked series of slightly winged simple bristles superiorly, with a few brush-shaped forms. Inferiorly are the jointed bristles, with boldly bifid tips. The latter become much more developed in the posterior feet, such as the twentieth, approximating in this respect to the tips of the inferior hooks, from the prominence and size of the lower process. The superior bristles posteriorly have less evident wings.

The upper spine becomes pale posteriorly, and is greatly developed.

This seems to be the young of *Eunice magellanica*, or of a closely allied form.

Eunice prognatha, n. sp. (Pl. XXXVII. figs. 16, 17; and Pl. XIXA. figs. 10, 11).

Habitat.—Dredged at Station 344 (off the Island of Ascension), April 3, 1876; lat. 7° 54′ 20″ S., long. 14° 28′ 20″ W.; depth, 420 fathoms; sea-bottom, volcanic sand; surface temperature, 82°·0.

The single example measures about 84 mm. in length and 9 mm. in diameter at its widest portion.

The tentacle and antennæ (Pl. XXXVII. fig. 16) are of moderate length, the former being about once and a half the breadth of the first segment, and the latter only slightly less. The two lateral antennæ are about a third shorter. All are slightly articulated, especially toward the tip. Just behind the latter pair on each side is the eye, which is large and irregularly ovoid, the long diameter being antero-posterior. The two tentacular cirri extend somewhat beyond the anterior border of the first (buccal) segment.

The maxillæ (Fig. 29) of this form present a much less marked curve than in the foregoing species, but on the other hand the tip is bent upward and inward abruptly. The whole organ appears longer from the modification of the outward curve, and is horizontally flattened. The groove at the knee posteriorly is deeper, and the adjoining ridges more pronounced than in the former species. The right great dental plate shows six teeth;

the left five. The left paired lateral plate has four teeth, and the unpaired eight teeth. The right lateral plate again has nine teeth. The ramus of the mandible (Figs. 30, 31) on each side is somewhat longer and more tapered than in the previous form.

In this species the branchiæ are somewhat better developed at the posterior third than anteriorly. The tenth foot has a small branchia in the form of a simple cylindrical process. At the twentieth foot the branchia is about twice as large. At the thirtieth foot (Pl. XXXVII. fig. 17) there are two branchiæ, one, however, being small. A single branchia occurs on the fiftieth foot, but there are two on the eightieth. The latter

Fig. 29. Fig. 30. Fig. 31.

Fig. 29.—Maxillæ and dental plates of *Eunice prognatha*, n. sp.; enlarged.
Fig. 30.—Mandible of the same species from the ventral surface; similarly enlarged.
Fig. 31.—Mandible from the dorsal surface; enlarged.

arrangement continues for a short distance, then a single organ occurs, and finally they disappear. The specimen, however, is in an imperfect condition. In some feet (between the sixtieth and seventieth) four or even five branchial processes are observed; and they seem to spring from the base in an arbuscular, not in a pinnate, manner.

The dorsal cirri appear to be slightly articulated, though the specimen is not in a favourable condition for accuracy in this respect. The anterior and posterior cirri are proportionally longer. The ventral cirrus is short and thick in front, more elongated toward the tail.

Each foot is furnished with two very powerful black spines, which have their tips attenuated and slightly curved. Superiorly are some brush-shaped bristles, the filaments of one edge being longer than those on the other. These bristles, however, do not seem to present specific differences, since in this species they exactly resemble those in the former. A series of simple, straight bristles occurs next, with slightly bent and attenuate tips, having hardly a trace of a wing. The jointed bristles (Pl. XIXA. fig. 10) inferiorly have a well-marked bifid tip to the distal region, the two divisions being more nearly equal than in *Eunice magellanica*. This, however, is not of much moment, since friction would account for the change. The outline of the wing also diverges from that in the species mentioned.

Most of the posterior hooks (Pl. XIXA. fig. 11) have the points so injured by friction that little more can be said than that they have a principal fang and a smaller process.

A feature of note in the sections of this species is the large size of the dorsal longitudinal muscles. The neural canal lies below the well-marked central region of the cords, and is smaller than in *Eunice magellanica*. The opaque, brownish granular region forms a wide arch above the cords, and passes down at each side.

This form somewhat approaches the *Eunice frauenfeldi* of Grube[1] from St. Paul (west coast of Africa). The latter has at most three divisions to the branchiæ, and they commence on the seventh instead of the tenth segment. The form of the foot is apparently very similar. Unfortunately the dentition is not minutely described or figured, and the same may be said of the bristles.

Eunice torresiensis, n. sp. (Pl. XXXVII. figs. 18, 19, 20, 21; Pl. XIXA. figs. 12, 13).

Habitat.—Dredged at Station 186 (Torres Strait), September 8, 1874; lat. 10° 30′ S., long. 142° 18′ E.; surface temperature, 77°·2; depth, 8 fathoms; sea-bottom, coral mud.

Two series occur, viz., two large fragments and a number of smaller specimens.

In the smaller specimens the tentacle is considerably longer than the antennæ, and reaches to the eighth or ninth segment. The antennæ are about a third shorter, and the outer processes less than the latter (Pl. XXXVII. fig. 18). The tentacular cirri extend forward rather beyond the anterior border of the buccal segment. All the foregoing processes are distinctly articulated, the terminal joints, indeed, being moniliform. The eyes lie a short distance behind the base of the outer process, and have their long diameter directed antero-posteriorly.

The dental armature (Pl. XXXVII. figs. 20, 21) is of a light brownish colour, with a dark brown band at the maxillary knee. The spatula-shaped posterior process of the

[1] Annel. Novara-Exped., Zool. iii. Bd. ii. p. 11, Tab. 1, fig. 3.

latter is also brownish, with the oblique pale region within the marginal blackish-brown belt. The maxillæ (Fig. 32) are gently curved. The great dental plate has four teeth on the left and three on the right. The left paired lateral plate has five or six, and the unpaired six teeth, while the right lateral has eight. Only a single flattened plate follows the paired lateral on each side. The dentary portion of the mandible (Fig. 33) is much produced laterally at the tip, the region having a rhombohedral aspect, with the long axis oblique.

The branchiæ are represented by a simple filament on the fourth segment, and soon attain considerable dimensions. At the tenth foot the branchial process has seven divisions, and the same number appears on the twentieth (Pl. XXXVII. fig. 19). The branches diminish to four on the fortieth foot, the same number also occurring on the

Fig. 32.

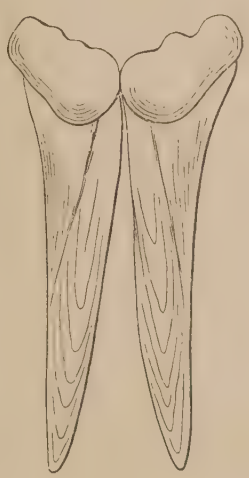


Fig. 33.

Fig. 32.—Maxillæ and dental plates of *Eunice torresiensis*, n. sp., from the dorsal surface ; × 15 diameters.
Fig. 33.—Mandibles of the same species from the dorsal surface ; × 15 diameters.

fiftieth. The branchiæ continue to the posterior end of the body, increasing both in length and in the number of the divisions some distance in front of the tail.

The dorsal cirri have very distinct articulations (Pl. XXXVII. fig. 19). The ventral cirri present no feature of note. They are thicker in front, more elongated posteriorly.

The foot in the anterior region of the body is provided with two strong yellowish spines, the points of which project beyond the skin. The brush-shaped bristles are less distinct than usual. The long simple bristles conform to the ordinary type. The compound forms (Pl. XIXa. fig. 12, from the twentieth foot) have the tip of the shaft dilated, serrated on the convex side, and with a comparatively limited striated region. The distal portion has the first hook larger than the second, and, as in the figure, the

terminal part of the wing is frequently abraded. In others the wing or guard projects as a slight process beyond the tip of the distal fang, and has a rib or thickened band along its dorsal edge. In some the entire wing has been removed by friction.

About the forty-fourth somite one or two hooks occur inferiorly in each foot. They are likewise yellowish, have a large fang, a bifid crown, and guards or wings at the tip. In some of the posterior feet hooks with three processes exist (Pl. XIXA. fig. 13), and it would appear from the minute structure of those in front that these also occasionally occur throughout.

The food consists of minute Algæ and muddy debris containing fragments of Crustacea, sponge-spicules, Foraminifera, and Diatoms. Firm ovoid pellets are formed in the sacculations of the posterior region of the alimentary canal.

Two fragments of the anterior region (measuring from 8 to 9 mm. in diameter), apparently of the adult of the same species, occurred with the others. These somewhat differ in regard to the branchiæ, which, though commencing on the fourth foot as in the foregoing case, soon exhibit a greater number of branches. Thus at the tenth foot there are thirteen or fourteen divisions. The tentacle is proportionally shorter, being only a little longer than the antennæ. The colour of the dental apparatus is dark brown, the basal spathulate plate of the maxillæ being blackish. In regard to the number of teeth on the various plates, these larger forms quite agree with the smaller. The maxillæ, however, show a characteristic median ridge at the tip (Pl. XXXVII. fig. 20), and at the lateral edges are also furnished with a prominent keel; indeed, the shape is peculiar. The differences in colour and in the development of the hard ridges are apparently due to age.

The ventral longitudinal muscles in a large example are somewhat ovoid in section, and their massive inner edges approach rather closely, so that the nerve-area is lengthened. The large neural canal lies below the cords, and the brownish granular mass fills up the region above them. The nerve-area proper shows superiorly two fibroid regions surrounded by a granular belt which also invests the neural canal. Certain of the vertical and oblique fibres are inserted above the nerve-area, while others (oblique) pass downward by the side. In a small specimen the nerve-area was shorter from above downward, probably from the less developed condition of the ventral longitudinal muscles internally.

The teeth in this species somewhat resemble those of Kinberg's *Eunice indica*[1] from Banks Strait, but the longer and more distinctly moniliform appendages of the head diverge. The dorsal cirri are also boldly articulated, whereas they are smooth in Kinberg's form. The bristles do not differ much. In the structure of the foot and in the large size of the dorsal cirrus *Eunice torresiensis* also resembles *Eunice australis*, De Quatrefages,[2] but the great dental plates have four teeth in the latter.

[1] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1864, p. 562.

[2] Annelés, vol. i., 1865, p. 321.

Eunice ærstedi (?), Stimpson (Pl. XXXVIII. figs. 1, 2; Pl. XIXA. figs. 14, 15).

Eunice ærstedi, Stimpson, Marine Invert. Grand Manan, 1853, pp. 34, 35.

Habitat.—A single specimen of good size was dredged at Station 45 (off the coast of North America, near New York), May 3, 1873; lat. 38° 34′ N., long. 72° 10′ W.; depth, 1240 fathoms; bottom temperature 37°·2 C., surface temperature 49°·5; sea-bottom, blue mud.

A smaller example occurred at Station 49 (a little farther north, off the same coast), May 20, 1873; lat. 43° 3′ N., long. 63° 39′ W.; depth, 85 fathoms; bottom temperature

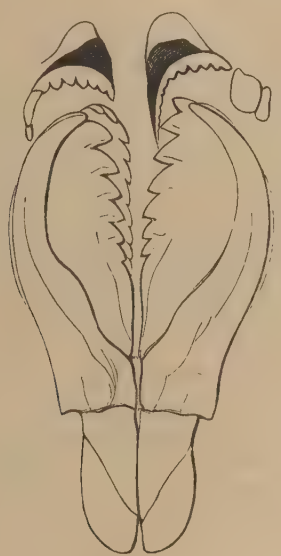


Fig. 34.

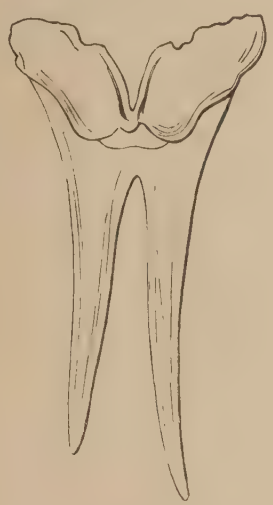


Fig. 35.

FIG. 34.—Maxillæ and dental plates of *Eunice ærstedi* (?), Stimpson, from Marion Island; × 15 diameters.
FIG. 35.—Mandibles of the same species from the dorsal aspect; × 15 diameters.

35°, surface temperature 40°·5; sea-bottom, gravel and stones. The other members of the fauna bore a close resemblance to those from the Gulf of St. Lawrence, Canada.

Several specimens were dredged at Station 144A (off Marion Island), December 26, 1873; lat. 46° 48′ S., long. 37° 49′ 30″ E.; surface temperature, 41°; depth, 69 fathoms; sea-bottom, volcanic sand.

The latter examples are about 90 mm. in length and 5 mm. in diameter.

The head (Pl. XXXVIII. fig. 1) (at present confining the remarks to those from Marion Island) very much resembles that of *Eunice norvegica*, Linn., from Bergen, Norway, the chief difference being that the tentacle and other cephalic processes are proportionally longer in the Norwegian forms. In both the most distinctly segmented process is the outer cirrus, and in each the tentacular cirrus extends forward beyond the anterior border of the buccal segment.

The maxillæ (Fig. 34) are more arched than in the European examples. The left great dental plate has six teeth and the right seven. The left lateral paired plate has about eight teeth, while the unpaired plate of the same side has nine. The paired plate on the right has twelve or thirteen small teeth. The mandibles (Fig. 35) resemble those of the European species.

The branchiæ commence on the third foot in each form. In the foreign example the branchia of the tenth foot has two divisions, that of the twentieth four (Pl. XXXVIII. fig. 2), the thirtieth four, and the fortieth none. Indeed the branchiæ generally cease about the thirty-eighth or thirty-ninth foot. The divisions of the branchiæ are well marked and rather long. In the Norwegian species the branchiæ on the tenth foot have four divisions, on the twentieth foot six, and on the thirtieth four or five. In the branchiæ of the form procured by the Challenger are numerous circular concretions resembling ova; their nature, however, is problematical.

The bristles on the whole resemble those of the Norwegian species, though their proportionally larger size brings out certain features more clearly. The distal pieces of the jointed bristles (Pl. XIXA. fig. 14) show no decided difference when contrasted with the organs from the same foot (twentieth) of the European species (Pl. XIXA. fig. 15). The brush-shaped bristles also correspond.

The caudal styles present evident articulations in correspondence with the condition of the other processes.

One example occurred in a chitinous tube strengthened with fragments of a Polyzoon like *Cellaria fistulosa*, minute Mollusks, *Lepraliæ* and other shell-fragments, after the manner of the British *Thelepus*.

The branchiæ of the small specimen from Station 49 cease about the fortieth foot, and have from eight to eleven branches. The maxillæ correspond with those of the previous example, and the left great dental plate similarly shows six teeth, the right seven teeth. The left lateral paired plate has eight, the left unpaired nine, and the same plate on the right nine or ten.

Some of the specimens from Marion Island have well-developed ova.

The food of the example from Station 45 (1240 fathoms) consisted of dark muddy material containing sponge-spicules, minute Globigerinæ, and other Foraminifera, Radiolarians, and particles of sand; while the pellets in some from Station 49 were composed of sandy mud less rich in sponge-spicules, Diatoms, and other organic structures. The intestines of those from Marion Island presented masses teeming with a series of beautiful Diatoms, various sponge-spicules, remarkable reticulated plates pertaining to an Echinoderm (somewhat resembling the anchor-plates of *Synapta*, but less regular), besides larger plates, closely arranged together, yet apparently belonging to the same group, and many other curious structures.

This species in transverse section shows a large and wide nerve-area, somewhat like that

in *Eunice norvegica*. Superiorly is the usual brownish, granular region, which stretches downward at each side. In some sections a bar of pigment occurs below the neural canal. The examples from Marion Island and Station 49 differ from the foregoing in having the neural canal widely dilated, so that the brownish opaque region superiorly forms a wall to the canal, but this difference is probably evanescent. In all the specimens the cuticle is somewhat thick.

This *Eunice* seems to come near the *Eunice ærstedi* of Stimpson, the chief difference being the number of divisions in the branchiæ, which Stimpson states is five. The *Eunice macrochæta* of Schmarda[1] is also a closely allied form procured on the southern shores of Jamaica. It has similar branchiæ of three or four divisions. The dorsal cirri, however, are very short, whereas in *Eunice ærstedi* they are long.

Eunice vittata, Delle Chiaje (Pl. XXXIX. fig. 18; Pl. XXIA. figs. 10, 11).

Nereis vittata, Delle Chiaje, Memorie, vol. iv. p. 195, 1829; Descrizione e Notom., p. 101, pl. cvi. fig. 12.

Habitat.—Dredged at Station 162 (off East Moncœur Island, Bass Strait), April 2, 1874; lat. 39° 10′ 30″ S., long. 146° 37′ E.; depth, 38 fathoms; surface temperature, 63°·2; sea-bottom, sand and shells.

This is evidently a young form, measuring about 18 mm. in length and about 1 mm. in diameter anteriorly. It is allied to the foregoing species, though there are certain evident differences.

The head has the tentacles and tentacular cirri distinctly annulated, at considerable intervals. The two anterior lobes (palpi) are well marked. The dental apparatus (Fig. 36) is pale, and the maxillæ much curved, features apparently common to immature forms. There are six teeth at least in the great dental plates. Three prominent teeth appear on the left lateral paired plate; at least six on the unpaired of that side, and this is also proportionally large, almost as large as the left great plate. The right lateral has at least seven teeth. The apparatus is too minute for other than microscopic discrimination, and hence the difficulty in regard to the curved plates. The dental apparatus on the whole corresponds with that of *Eunice vittata*.

Fig. 36. Maxillæ and dental plate of *Eunice vittata*; ×40 diameters.

The branchiæ are represented on the third foot by a simple filament, which increases to two and a rudimentary third on the tenth foot, three on the twentieth foot (Pl. XXXIX. fig. 18), and this seems to be the maximum. The branchiæ have two branches on the thirtieth foot. These organs are somewhat elongated, like those of *Eunice limosa*, Ehlers, and of similar (slightly tapered) shape. They are richly ciliated.

[1] Neue wirbell. Thiere, I. ii. p. 128.

The dorsal cirrus does not show distinct annulations. The foot bears in front two pale spines, and in the posterior region of the body, in addition, a strong curved hook (Pl. XXIA. fig. 11) with three teeth, viz., a main fang and two smaller processes above it. It differs from that in *Eunice bassensis* in having the latter more prominent, but such may be due to differences in age. *Eunice limosa*, Ehlers, has a similar elevation of these terminal hooks.

The dorsal bristles present no peculiarity. The compound forms (Pl. XXIA. fig. 10) have a stoutish, slightly curved shaft, without distinct striæ in the dilated part at the tip, though the margins of the latter are serrated. The distal region has a widely bifid extremity.

In transverse section the oblique muscles form a strong plate over the nerve-area. The nerve-cords are comparatively large, and the neural canal is normal in position. At the bases of the feet, and on each side of the alimentary canal inferiorly are cellulo-granular masses, probably connected with reproduction. The cuticle is dense. The longitudinal dorsal muscles form a comparatively uniform arch superiorly, only a little enlargement occurring at the inferior margin of each. The ventral longitudinal muscles are ovoid in section.

Eunice vittata, Delle Chiaje, var.? (Pl. XXXVIII. figs. 3, 4, 5; and Pl. XIXA. figs. 16, 17).

Habitat.—Several specimens occurred between tide-marks at Bermuda in June 1873.

The examples vary in size, the larger having a diameter of about 3 mm.

The general aspect of the form resembles the European *Eunice vittata*, Delle Chiaje. The head (Pl. XXXVIII. fig. 3), however, presents much more distinctly articulated tentacles. The frontal lobes are similarly separated only by a deep notch. The eyes are large, and show a pale lens-like centre. The tentacular cirri barely reach the anterior margin of the buccal segment.

The dental apparatus in this form is curiously barred with brown and black pigment.

The branchiæ commence on the fifth foot and cease about the thirtieth. They have five divisions on the twentieth foot (Pl. XXXVIII. fig. 4), in which the ventral cirrus is more tumid at the base than in the thirtieth (Pl. XXXVIII. fig. 5), though the divisions of the branchiæ are the same.

The setigerous region of the foot has yellowish spines. The tips of the jointed bristles (Pl. XIXA. fig. 16), while differing from the representation given by Prof. Ehlers,[1] yet very closely approach the same parts in specimens of *Eunice vittata* from Guernsey.

In the developing (or most complete) posterior hooks (Pl. XIXA. fig. 17) the crown is

[1] *Op. cit.*, Taf. xv. fig. 18.

trifid, and the same remarks apply as in the foregoing case when compared with Prof. Ehlers' figure of *Eunice vittata*, and the actual specimen from Guernsey.

In transverse section this very much resembles the foregoing, the only difference being the somewhat narrower and deeper nerve-area, a condition probably connected with the state of the preparation.

Eunice cirrobranchiata, n. sp. (Pl. XXXVIII. figs. 9, 10, 11 ; Pl. XIXA. figs 21–24).

Habitat.—Found between tide-marks at Bermuda in June 1873.

The fragment is about 30 mm. in length and about 4·5 mm. in breadth. Unfortunately it appears to have been dried.

So far as the specimen shows, the head has comparatively short tentacular processes, which also appear to be slightly articulated. The buccal segment is large, with a much produced lobe on each side. The tentacular cirrus is short, scarcely stretching forward to the middle of the segment.

The maxillæ (Pl. XXXVIII. fig. 9) are strongly curved, and tinted of a dull madder-brown hue. The left great dental plate has five prominent, sharp teeth. There are also five on the right (the fifth being small). They diminish in size from before backward, and the brownish chitin is tipped with a translucent margin on the free edge of each tooth. The left lateral paired plate has only a single tooth. The unpaired plate of the same side has seven teeth. The right lateral plate has eight teeth. The mandibles (Pl. XXXVIII. fig. 10) show a broad irregular, slightly produced margin, and the roots are comparatively broad.

The branchiæ commence about the twenty-third segment, in the form of a single long process, springing from the base of each cirrus dorsally. The organs increase in length posteriorly, two long processes occurring on the fiftieth and sixtieth feet (Pl. XXXVIII. fig. 11).

The foot bears dorsally a moderately elongated cirrus, which, in the tenth foot, does not reach the tip of the superior (simple or winged bristles), though it is somewhat longer posteriorly. The base of the process is supported by a series of simple bristles, which represent the dorsal tuft. The upper bristles (Pl. XIXA. fig. 21) are long, straight, and stout, the tip being somewhat short, with a wing at each side. Short brush-like bristles accompany them. Then follow a series of jointed bristles (Pl. XIXA. figs. 22 and 23, the latter being considerably compressed). The tip has a strong fang, with a smaller hook above it, both being guarded by a wing. A single dark spine occurs in each foot anteriorly, but toward the twentieth foot a dark brownish hook appears (Pl. XIXA. fig. 24). The terminal hook of the latter is well marked, and the fang beneath large and strong. The short wing guards both points.

In transverse section a prominent feature is the very large size of the dorsal longitudinal muscles in comparison with the ventral. The greater part of the area in the preparation of the body is occupied by the four muscular bands. The dorsal masses form almost a half moon, while the ventral are ovoid. A considerable incurvation exists on the ventral surface at the nerve-area, which is of moderate depth, and has the neural canal inferiorly. Superiorly the area is bounded by the oblique muscles which meet in the middle line. Next is the brownish opaque granular area, between which and the neural canal is a considerable space. The alimentary canal presents a distinct longitudinal layer outside the circular muscular coat on which the glandular lining rests. Two muscular bands from the outer wall of the canal cross inferiorly, and form an arch for the median blood-vessel.

In regard to the simple condition of the branchial processes this form approaches *Marphysa*, but the presence of the tentacular cirri and bristles is sufficiently diagnostic.

Eunice kobiensis, n. sp. (Pl. XXXVIII. figs. 12, 13; and Pl. XXA. figs. 1, 3).

Habitat.—Dredged off Kobé, Japan, in 8 to 50 fathoms.

The length of the example, which is incomplete posteriorly, is about 58 mm., and its greatest diameter about 3·5 mm.

The head (Pl. XXXVIII. fig. 12) of this form is distinguished from that of *Eunice norvegica* by the much more deeply cleft palpi or anterior lobes. The segmentation of the tentacular processes is also more distinct. The tentacle reaches to the tenth or eleventh segment, and its constrictions are at wide intervals, especially toward the tip. The next pair (which are considerably shorter) have narrower segments, a feature still more evident in the outer short pair. The buccal segment is comparatively narrow, and the tips of the tentacular cirri reach considerably beyond its anterior margin.

The dental apparatus (Figs. 37 and 38) is pale brownish, with various darker and lighter bands. The maxillæ are moderately arched. The left great dental plate shows seven teeth, the right eight. The left lateral paired plate has ten teeth, the left unpaired eight, both sets being comparatively small. The right lateral plate has about twelve small teeth. There is only a single accessory plate at the end of each paired plate.

The branchiæ are represented by a minute process on the third foot, and at the tenth present six firm branches of moderate length, but it is a noteworthy feature that neither in these nor in the succeeding branchiæ are the blood-vessels visible. The entire process is filled with coarse granular matter like the dorsal cirrus. In the twentieth foot (Pl. XXXVIII. fig. 13) the branchiæ have eight divisions, each coming off somewhat stiffly from the main stem, and at nearly equal distances. At the thirtieth foot there

are only seven branches, at the fortieth three, and the branchiæ finally disappear at the fiftieth. They thus extend considerably further backward than those of *Eunice norvegica*, in which they commence on the fifth and end at the fortieth foot. There is nothing diagnostic in the arrangement of either dorsal or ventral cirrus in the new species.

Anteriorly each foot has two or three yellowish spines with bluntly pointed and slightly curved tips. Superiorly are long simple bristles (Pl. XXA. fig. 1), with delicately tapered extremities. No distinct wing is seen in ordinary views, but the tip is flattened and serrated at the edge, apparently instead of the former processes. The brush-like forms accompanying them do not show any other peculiarity than an indication of minute points on the surface. The lateral fibre of one side, as usual, exceeds the other in length. The terminal piece of the jointed bristles beneath (Pl. XXA. fig. 2) is comparatively short, and there are five serrations below the first curve of the wing. The end of the

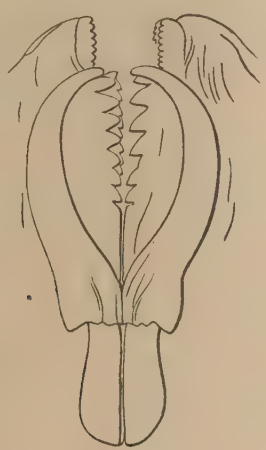


Fig. 37.

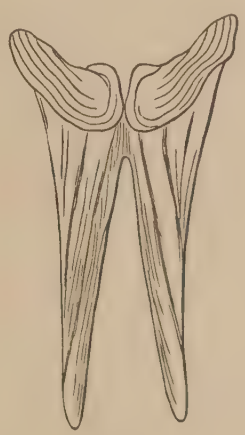


Fig. 38.

FIG. 37.—Maxillæ and dental plates of *Eunice kobiensis*, n. sp., partly extruded; × 20 diameters.
FIG. 38.—Mandibles of the same form; × 25 diameters.

shaft is somewhat large, serrated along the prominence of the curve, and with a very well defined mark internally. There is little difference, save in length, between the foregoing bristles and those on the twentieth foot.

The posterior hooks (Pl. XXA. fig. 3) present a single large powerful fang, with a curved terminal process superiorly.

The pellets in the posterior region of the intestine contained sandy mud, in which Diatoms and other microscopic organisms occurred.

In section the cuticle is comparatively thick, and the nerve-area deep. A dense granular opacity exists beneath the junction of the oblique muscles, and a large neural canal inferiorly. Strong bands of muscular fibres (from the oblique) pass down by the side of the cords to the circular coat, and thus the ventral longitudinal muscles are firmly clasped. The suspensory bands from the median dorsal region send some of their

fibres inferiorly in the same direction. Large dilatations of the blood-vessels occur anteriorly at each side of the alimentary canal.

This species approaches Marenzeller's *Eunice microprion*[1] in the sparsely jointed tentacles, in the shape of the feet, the number of the branchial divisions, and also in the compound bristles ("Sichelborsten"); but it differs in having dorsal bristles without a distinct wing, whereas in *Eunice microprion* the wings are present. The posterior hooks also diverge to a certain extent. Moreover, in *Eunice microprion* the branchiæ commence as processes of three divisions on the sixth foot. The teeth of the great dental plates are more numerous in the new form, and the shape of the posterior processes of the maxillæ also differs.

Eunice edwardsi,[2] n. sp. (Pl. XXXVIII. figs. 14, 15; Pl. XXA. figs. 4–7).

Habitat.—Dredged at Station 145 (off Prince Edward Island); lat. 46° 43′ S., long. 38° 4′ 30″ E.; surface temperature, 41°; depth, 140 fathoms; sea-bottom, volcanic sand.

A species of moderate dimensions, measuring between 70 and 80 mm. in length, and having a diameter of about 4 mm. at the anterior third.

The head (Pl. XXXVIII. fig. 14) is characterised by tentacles of average length (the median reaching the third foot), moderately thick, though slightly tapered, and divided by constrictions into segments. The others have the usual proportions. The outer, however, are broken. The tentacular cirri are large and long, extending considerably in front of the anterior border of the buccal segment. The constrictions in these are wide apart, and perhaps the same exists in the others, for their preservation is less satisfactory. The frontal lobes are notched, but not deeply. In front of the outer tentacle is a distinct ocular spot on each side, and behind it (close to the outer side of the base of the inner tentacle) is a well marked eye.

The buccal segment is equal to about two of the succeeding, and its posterior moiety bears the cirri formerly mentioned. Its lobes are not much developed inferiorly and laterally.

The dental apparatus (Fig. 39) is pale brownish, with darker touches. The maxillæ offer no peculiarity. The left great dental plate has eight teeth, and the same number is found on the right. The left lateral paired plate has six, and at the end are two accessory plates. The left unpaired lateral has nine teeth. On the right lateral plate are eleven teeth, and two accessory plates. In the mandibles (Fig. 40) the dentary region is petaloid inferiorly, and its cutting edge has one or two irregular elevations.

The branchiæ are represented on the third segment by a small simple process. The latter increases in size to the tenth, where it is still a simple filament, rather more than half

[1] Südjapan. Annel., p. 27.

[2] Called after Prof. Milne-Edwards, who formerly did much good work amongst the Annelids.

the length of the dorsal cirrus. At the twentieth foot (Pl. XXXVIII. fig. 15) there are six branches, and most show the reddish-brown bodies formerly noticed; moreover, these also occur in the dorsal cirrus, so that they are not peculiar to the branchiæ. They are probably nucleated pigmentary bodies. The branchia of the thirtieth foot has five branches; but on the fortieth it is represented only by a simple filament, almost as long as the cirrus, and the organ vanishes immediately afterwards (about the forty-first foot).

The anterior feet have a dorsal cirrus of considerable length (a little shorter than the tentacular cirrus) and similarly segmented. A few simple bristles pass the branchial stem and enter its base. The ventral cirrus in this region is very large, forming a prominent

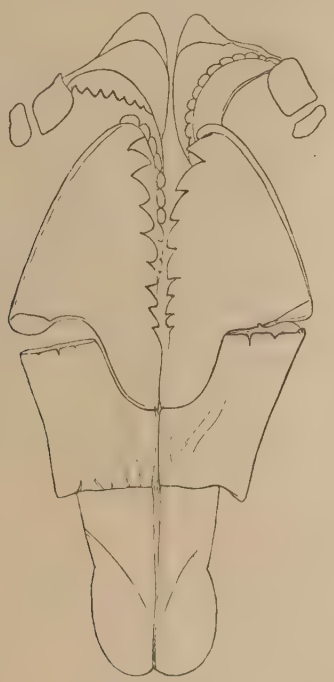


Fig. 39.

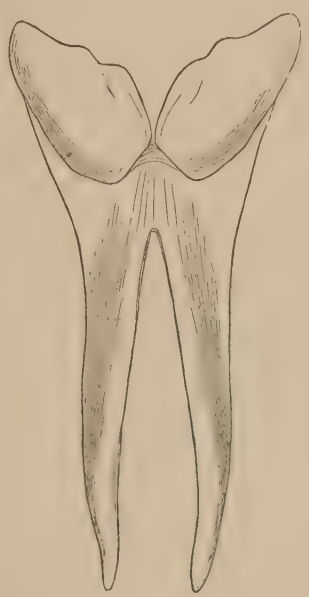


Fig. 40.

Fig. 39.—Maxillæ (fractured) and dental plates of *Eunice edwardsi*, n. sp.; × 20 diameters.
Fig. 40.—Mandibles of the same from the dorsal surface; × 20 diameters.

and broad horizontal lamella in all probability of considerable importance in regard to the habits of the species. The first six are about equal in size, the diminution only affecting the seventh. On the whole the inferior cirrus is well marked and large throughout.

Dorsally is a tuft of long simple bristles (Pl. XXa. fig. 4) somewhat like those with the serrated edge in *Eunice cirrobranchiata*. The brush-shaped forms (Pl. XXa. fig. 5) have comparatively few (about five) short teeth, and the single long lateral process is stoutish. The jointed bristles (Pl. XXa. fig. 6) show the usual bifid tip, neither process being long. It is serrated along the inferior edge. The tip of the shaft is also serrated and striated internally. The spines are yellowish and comparatively stout, the tips

being curved and diminished to a blunt point. The inferior hooks (Pl. XXA. fig. 7) have likewise thick shafts, while the tips are rather attenuate. Both the terminal and great fang are comparatively short.

The intestinal contents consisted of various chitinous shreds, spinous in some cases, a few claws of minute Crustacea, numerous Diatoms and Radiolarians.

In transverse section no special feature occurs, except the dilatations of the neural canal. The nerve-area is moderate in depth.

Grube[1] meagrely describes from a figure of Œrsted's a species from Punta Arenas in Costa Rica, which is of an ochreous colour with whitish spots anteriorly, as if reticulated. The thick clavate and short tentacles are not articulated. The eyes are four. The dorsal cirri are not segmented and scarcely longer than the bristles. He again alludes to this form in his later remarks on the Eunicidæ,[2] referring especially to the club-shaped tentacles. He places the species, which he thinks had simple (cirrus-like) branchiæ, under his third subgenus, *Marphysa*, without the tentacular cirri on the buccal segment, a statement which at once distinguishes it from the present form.

Eunice aphroditois, Pallas (Pl. XXXVIII. figs. 16, 17 ; Pl. XXA. figs. 8–10).

Habitat.—Dredged off Port Jackson, Sydney, April 18, 1874, at a depth of 2 to 10 fathoms ; and also procured between tide-marks at Samboangan. This fine species ranges throughout the Indian Seas, the first example having been brought to Pallas from the coast of Ceylon. The specimen measures about 230 mm., with a diameter, at its widest part, of nearly 12 mm. across the bases of the ventral cirri.

In general appearance (Pl. XXXVIII. fig. 16) it agrees with the description given by Prof. Ehlers.[3] Certain minute points in the anatomy, however, diverge, and hence it is necessary to go into details. Thus while the maxillæ of this form (Fig. 41) agree in contour with the figure of the author just mentioned, there is in addition a prominent keel on the dorsal surface. The sharp inner edge does not show the slight denticulations noticeable in the large form from Samboangan. The maxillæ in these large specimens do not seem to have much free motion, since they are clasped by external processes from the great dental plates. They appear to be less curved also than in the smaller forms. In the present example a calcareous (?) deposit occurs on the dorsal surface of the tip of the left maxilla. The left great dental plate has six teeth, and the same number occurs on the right ; whereas Ehlers gives four and five respectively as the corresponding numbers in *Eunice aphroditois*, Pallas. The left lateral paired plate has five denticulations, two of these being marginal (one at each end), and the first accessory lateral plate terminates superiorly in a long conical tooth. The left unpaired plate has seven teeth. Ehlers

[1] Annulata Œrstediana, p. 60. [2] Schles. Gesellsch., 1877, p. 23. [3] Die Borstenwürmer, Bd. ii. p. 306.

gives five and three respectively. The right lateral plate has eight teeth, being one more than stated by Ehlers. The mandibles are not immovably fixed to each other, and the dentary region has an ovoid outline inferiorly, while dorsally its area is less than in the next form from Samboangan. The mandibular shafts are finely veined like sections of pitch-pine. In the much larger example, apparently of the same species, from Samboangan, the inner edge of each maxilla is slightly denticulated. The great dental plates do not diverge from the foregoing, but the left lateral paired plate (which is injured) appears to have only three teeth. The dentary region of the mandible is obliquely rhomboidal and somewhat concentrically veined, like the shell of a bivalve,

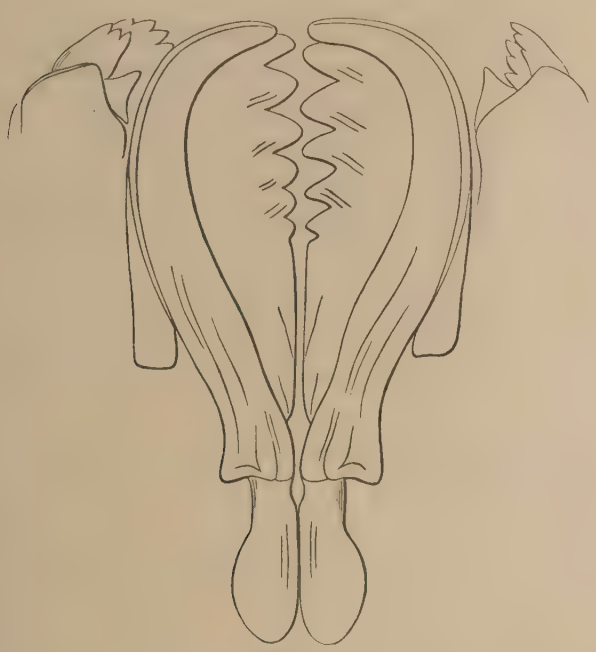


Fig. 41.

Fig. 42. Fig. 43.

Fig. 41.—Maxillæ and mandibles of *Eunice aphroditois*, Pallas, from the ventral surface; enlarged.
Figs. 42, 43.—Mandibles viewed respectively from the dorsal and ventral surfaces; similarly enlarged.

on the ventral surface (Fig. 43), but dorsally (Fig. 42) it forms a short cone, and does not extend so far outward as the shaft or basal region. The mandibles are firmly united.

In the specimen from Samboangan the branchiæ arise on the fifth segment as a small tuft, whereas in the other they are represented in the sixth segment by a simple filament. There are upwards of thirty divisions in the branchiæ (Pl. XXXVIII. fig. 17) in this form, whereas there are about eighteen in the example from Port Jackson, the pinnæ in the latter being also considerably longer in proportion. It is difficult to say how age affects these points.

Most of the tips of the jointed bristles have been rubbed off, so that it was with some difficulty that a complete example (Pl. XXA. fig. 8) from the middle of the body was obtained. The serrations along the edge of the distal end of the shaft are very minute, probably from abrasion, the surface having only a slightly punctated appearance. The ends of the spines in the setigerous division of the foot are often slightly worn. The tip of the hooks from the posterior region (Pl. XXA. fig. 9) presents a somewhat elongated terminal process with a strong main fang beneath. The curves of the extremity and general contour of the hook seem to differ from those of its allies.

The foot in the specimen from Samboangan (Pl. XXXVIII. fig. 17) bears two blackish spines, but no inferior hook is present. The dorsal cirrus is thicker and less tapered than in that from Port Jackson. Moreover, the jointed bristles appear to diverge considerably from those of the Australian form. Thus (Pl. XXA. fig. 10) the direction of the lower process at the tip is upward, and the entire hook is shorter and stouter. The shape of the distal end of the shaft also differs, and while the convex edge (as in its allies) is distinctly serrated, the whole surface of this region is further minutely granular like shagreen.

The intestine in that from Samboangan contained masses of sandy mud loaded with sponge-spicules, Diatoms, a few fragments of Crustaceans and Algæ, and here and there bright red spicules, apparently Holothurian. In the Australian example masses of Algæ filled the alimentary sacculations.

The great size of this form shows the disproportion between the dorsal and the ventral muscles, the area covered by each of the former being nearly double that of the latter. The dorsal muscles have three folds above the great inferior lobe. The vertical muscular bands passing down from the median line penetrate the circular muscular coat and are lost in the hypoderm. The oblique muscles proceed by the side of the nerve-area and decussate beneath it, the fibres running on each side into the circular coat. The nerve-area is somewhat wedge-shaped, wide above and narrow below. Externally the investment is soft and granular, so that the denser central region is clearly outlined. The latter is constricted in the middle, and has two opaque spots toward its upper border. The median neural canal is of considerable size. A little above the nerve-area and beneath the blood-vessels is a median canal.

The section of the same region (anterior third) of that from Samboangan differs in the very great vascularity of all the tissues beneath the hypoderm. The size of some of the vessels in the circular muscular coat is striking. The neural canal is much more dilated, and it is surrounded by an opaque belt inferiorly. The decussation of the fibres from the oblique muscles below the canal is less evident. An opaque band occurs in the circular coat in the median line inferiorly.

Eunice torquata (?), De Quatrefages (Pl. XXXVIII. fig. 18 ; Pl. XXa. figs. 11–13).

Eunice torquata, De Quatrefages, Annelés, t. i. p. 312, 1865.

Habitat.—From St. Vincent, Cape Verde Islands, July 1873. Probably a shore-form.

The specimen measures about 90 mm. in length and about 7 mm. in diameter (over the ventral cirri) anteriorly. It is in two fragments, and the tail is absent.

The head has two deeply bifid lobes, which in the preparation are still reddish-brown superiorly. The tentacles are of moderate length, and all deeply ringed. The tentacular cirri extend in front beyond the margin of the buccal segment. The single large eye occupies the usual position on each side.

The dental apparatus is dark brown, with a few lighter touches. The maxillæ (Fig. 44) have a distinct median ridge near the tip, and, as usual in the larger forms, the curvature is moderate. The left great dental plate has five teeth, the right the same number, but the first and last are small. The left lateral paired plate shows four teeth, and the first accessory plate forms another conical tooth next it. The unpaired lateral plate of that side has five teeth. The right lateral plate presents eight teeth, and, as in the former case, the first accessory plate is toothed. The shape of the posterior or basal piece of the maxillæ is peculiar, a notch occurring in the rounded posterior margin. The mandibles (Fig. 45) present a somewhat rhomboidal dental plate ventrally.

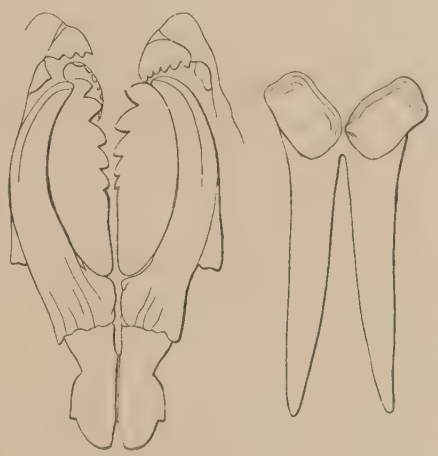


Fig. 44. Fig. 45.

Fig. 44.—Maxillæ and dental plates of *Eunice torquata*, De Quatrefages ; × 12 diameters.
Fig. 45.—Mandibles of the same species, from the ventral surface ; × 12 diameters.

The buccal segment is broad ; the portion from which the tentacular cirri spring being narrow. The fourth and fifth segments (reckoning the buccal as the first) are pale, all the rest being pale reddish-brown. They thus appear to have been whitish during life.

The branchiæ are represented on the fourth foot by a simple filament, and rapidly attain full development. The fifth foot has a process bearing three divisions, and these increase to four on the sixth foot. The branchia on the tenth has six divisions, and its form is that of a broad and short arbuscle. The lower branch is about as long as the dorsal cirrus, and the second is only a little shorter. The twentieth foot has five divisions, the thirty-sixth (Pl. XXXVIII. fig. 18) three, and the same number occurs on the fiftieth and seventieth. They diminish to a single process near the tail, and disappear before reaching the latter.

The dorsal bristles, even in the anterior feet, show only traces of wings, which are furnished with serrations at the margins. The brush-shaped forms present a broad summit. The bifid portion of the jointed bristles (Pl. XXA. fig. 11) is well marked and characteristic, the terminal hook being the larger. The tip of the shaft is serrated on the convex edge, and the internal striæ pass a considerable way downward.

There are two blackish spines; and the posterior hooks (Pl. XXA. fig. 12) are also blackish. These hooks appear to have only a single wing, and thus differ from the terminal portions of the bristles, which have two. The example figured is in the usual condition, viz., considerably worn. When a developing hook is observed in the tissues of the foot (Pl. XXA. fig. 13) its state is very different, for each process is produced and pointed.

The intestine contained greyish calcareous mud in which a few sponge-spicules, Ostracoda, and other organisms occurred.

In transverse section this agrees in the main with the typical form. The nerve-area is somewhat deeper, and an opaque region occurs superiorly in the preparations.

In general appearance this most closely approaches the *Eunice torquata* of De Quatrefages, though there are certain differences, probably resulting from variation, in the structure of the branchiæ and other parts. The species seems to have a considerable range.

Eunice elseyi (?), Baird (Pl. XXXIX. figs. 1-3; Pl. XXA. figs. 14-16).

Eunice elseyi, Baird, Proc. Linn. Soc. Lond. (Zool.), vol. x. p. 344.

Habitat.—Procured in the Arafura Sea.

Two sizes occur, one somewhat larger than the European *Eunice torquata*, and one smaller. Both are fragmentary. The larger measure about 45 mm. in length, and have a diameter of about 7 mm. at their widest part. The smaller range to a fifth of this size.

The anterior lobes of the head (Pl. XXXIX. fig. 1) are deeply fissured. In the larger specimens the tentacles are all less complete, as well as more irregular than in the smaller, but both are moniliform. In the most perfect they are somewhat long, and very boldly annulated at short intervals. The eyes are well marked, and in their ordinary position. The tentacular cirri do not reach the anterior border of the buccal segment.

The dental apparatus has various shades of brown, with darker touches. The maxillæ (Fig. 46) are distinctly curved, and at the tip present a short keel above the inner edge. The left great dental plate has five teeth, the right six. The left lateral paired plate has five or six teeth, the unpaired lateral of the same side six or seven. The right lateral has ten or eleven. Only a single accessory plate exists at the end of each lateral paired plate. In has a flat cutting edge. The mandibles (Fig. 47) present a deep notch on the external border, near the tip, ventrally.

The branchiæ (Pl. XXXIX. fig. 2) commence on the sixth (in one on the seventh) foot as large processes, possessing in the best developed forms from twelve to fourteen branches, a feature by no means common. They seem to be continued to the posterior end of the body, being largest, however, in the anterior third. The number of divisions in the finest examples reaches seventeen or eighteen (Pl. XXXIX. fig. 3).

The simple bristles have serrated edges, and a minutely spinous surface along the tip. The brush-shaped forms have a moderately developed extremity, with one long lateral process. The surface beneath is minutely spinous. The jointed bristles (Pl. XXA. fig. 14) show two well-marked processes distally, and the enlarged end of the shaft is

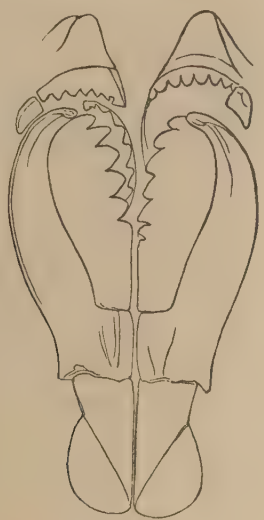


Fig. 46.

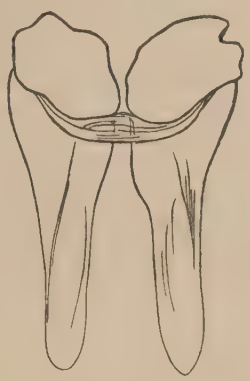


Fig. 47.

Fig. 46.—Maxillæ and dental plates of *Eunice elseyi*, Baird ; × 12 diameters.
Fig. 47.—Mandibles of the same form, from the dorsal surface ; × 12 diameters.

serrated on the edge, and minutely spinous over the striated region. Some posteriorly present a small process behind the terminal hook (Pl. XXA. fig. 15), so that there are three of these points. In the larger specimens the inferior hook is proportionally smaller than in the others. The spines are all light yellow.

The pale yellow posterior hooks (Pl. XXA. fig. 16) have a powerful main fang, surmounted by a process bearing two smaller. The wing or guard is seldom complete.

The intestine contained greyish pellets composed of muddy sand, sponge-spicules, Foraminifera, spicules of Gorgonias, and other organic debris.

In this species the ventral longitudinal muscles are considerably less as well as more flattened in section than in the previous species, their inner edges are less bulky, and thus the nerve-area is shorter in vertical diameter. Very strong oblique muscles meet in the middle line and arch over the area, the outer fibres passing as a powerful band down to the hypoderm, and expanding there so as to form a broad base

to the pillar. Only a few of the inner fibres cross in the middle line inferiorly. The circular muscular coat is of considerable thickness, but the hypoderm is remarkably thin. The nerve-area is confined by these surroundings to a comparatively small oval tube presenting superiorly the two fibrous or firm pale central regions, and inferiorly the neural canal and its granular coat. In the ganglionic parts the investment seems to be less complete, and a large opaque area exists superiorly.

Dr. Baird does not give the dentition of his form, which was collected during the Australian expedition (before 1857 ?) by Dr. J. R. Elsey, but so far as the other features are described the specimens procured by the Challenger seem to be identical.

Eunice murrayi,[1] n. sp. (Pl. XXXIX. figs. 7, 8 ; (Pl. XXa. figs. 19, 20).

Habitat.—Dredged in Simon's Bay, Cape of Good Hope, December 1873 ; depth, 18 fathoms.

A single example, measuring 38 mm. in length and having a breadth at the thick anterior part of about 4·5 mm. was procured.

The head (Pl. XXXIX. fig. 7) is furnished with somewhat thick and very distinctly segmented tentacles, which, indeed, are almost moniliform. The median seems to be somewhat longer than the adjoining, but it is incomplete. The segments have considerable breadth, hence the term moniliform is appropriate. The palpi anteriorly are separated by a deep notch. The tentacular cirri just reach the anterior border of the buccal segment, and like the other cephalic processes possess long segments, only four being present.

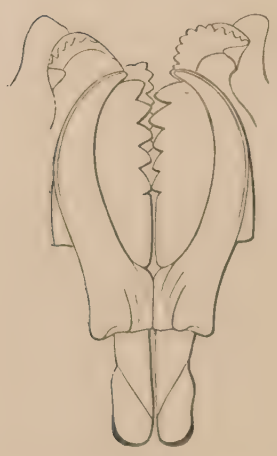


Fig. 48.

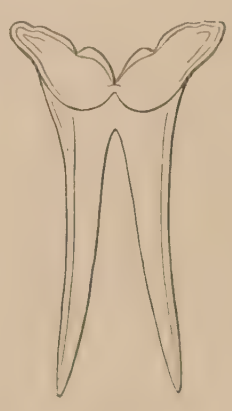


Fig 49.

Fig. 48.—Maxillæ and dental plates of *Eunice murrayi*, n sp.; × 15 diameters.
Fig. 49.—Mandibles of the same species, from the dorsal aspect ; × 15 diameters.

The dental apparatus is dull madder-brown, with boldly marked lighter touches. The maxillæ (Fig. 48) are moderately curved. The long spathulate processes posteriorly have a characteristic shape and are less rounded than usual. The left great dental plate has five teeth, the right six. The left lateral paired plate shows five teeth, the three inner being larger : and only a single accessory plate with a short dental cone is appended on each side. There are six well-marked teeth

[1] Named after the able Director of the Challenger Commission.

in the left lateral unpaired plate. The right lateral plate shows nine teeth, all smaller than on the corresponding plate on the left. The mandibles (Fig. 49) have the outer angle anteriorly much produced, and the cutting margin denticulated.

The branchiæ are represented on the fifth (or sixth) foot by a simple filament, but on the seventh form a considerable process of six divisions. There are nine ramifications on the tenth foot (Pl. XXXIX. fig. 8), and they are comparatively thick, each branchia forming a stiffish pectinate process. The twentieth foot has seven divisions, the terminal being minute. The thirtieth foot has a single branchial filament, which disappears altogether a few segments behind that just mentioned.

The dorsal cirri are proportionally large, and have few articulations. The dorsal bristles consist of somewhat stiff and slightly curved tapering bristles.

The jointed bristles (Pl. XXA. fig. 19) also have rather stout shafts and short terminal pieces, the most characteristic feature of the latter being their size and strength. The bifid tip is somewhat evenly divided. As usual there is a slight increase in the size of the inferior fang in the posterior segments.

The anterior feet have two strong yellowish spines. At the thirtieth foot there are also two long hooks inferiorly. The latter (Pl. XXA. fig. 20) present distally a series of three fangs, the terminal being least, and the inferior largest. They are also of a golden or yellowish colour. In some (especially the anterior) the middle fang is more erect.

The anus presents about six symmetrical papillæ at the rim, and inferiorly the two terminal cirri, which, like the tentacles, are somewhat thick, and show about six segments. Below the attachment of each is also a minute filiform cirrus.

The whole body of the animal is somewhat rapidly tapered from the anterior to the posterior end, and the skin and tissues are comparatively tough.

The pellets in the intestine consisted of muddy sand containing loose sponge-spicules, Diatoms, and small masses of sponge-tissue loaded with minute fusiform spicules.

In this species the ventral longitudinal muscles are comparatively large and ovoid, their shape being retained by an environment of muscular bands. The nerve-area is of considerable depth, an opaque granular region occurring beneath the insertions of the oblique muscles superiorly, and a small neural canal toward the ventral edge. The lateral muscular fibres do not decussate below the area, but curve outward round the ventral longitudinal muscles.

Eunice mindanavensis, n. sp. (Pl. XXXIX. figs. 9, 10; Pl. XXA. figs. 21, 22).

Habitat.—Dredged at Station 201 (in Basilian Strait off Mindanao, one of the Philippines), October 26, 1874; lat. 7° 3′ N., long. 121° 48′ E.; depth, 82 fathoms; surface temperature, 83°·0; sea-bottom, stones and gravel.

The specimen is fragmentary, and the anterior region has a diameter of 4·5 mm.

The head (Pl. XXXIX. fig. 9) has been partially dried, but seems to have long tapering annulated tentacles. The tentacular cirri are long and tapering, and extend nearly a third of their length beyond the anterior margin of the buccal segment.

The dental apparatus is for the most part pale buff, the tips of the maxillæ, the edges of the great dental plates, and the spathulate posterior processes alone being dull madder-brown. The maxillæ (Fig. 50) are slightly curved, and the tips cross each other in action, the right point going under the left. The motion of these organs appears to be more a folding together of the halves, so as to cause the grooves at the base to interlock, than mere scissor-motion. When the dental apparatus is protruded, the lateral

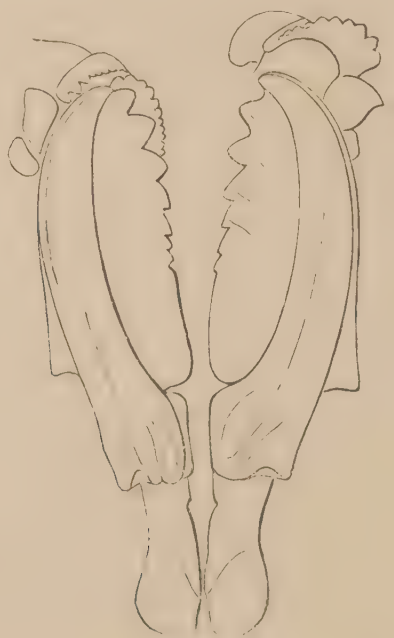


Fig. 50.

Fig. 51.

Fig. 50.—Maxillæ and dental plates of *Eunice mindanavensis*, n. sp. The former and the right lateral plate have been separated; ×15 diameters.

Fig. 51.—Mandibles of the same species, from the dorsal aspect; × 15 diameters.

plates (paired) are drawn upward and backward to guard the space that exists there, while the maxillæ and great dental plates are thrust outward. The left great dental plate has seven teeth, the right the same number. The left lateral paired plate exhibits four large teeth (next the accessory plate) and a series of five or more minute teeth adjoining. The left lateral unpaired plate shows nine or ten teeth. The right lateral also has nine or ten teeth. There are two accessory plates on each side, the first having its upper third developed into a conical tooth; and the second presenting a small flat dental edge. The mandibles (Fig. 51) present an irregular anterior edge, and

the outer has a distinct fold inferiorly. The surface is marked by somewhat concentric veins.

The branchial system begins on the sixth foot as a process of one or two divisions of considerable length (reaching the terminal third of the dorsal cirrus at the tenth foot), and the organs continue bifid throughout the anterior fragment (Pl. XXXIX. fig. 10). A portion of the posterior region, in the same bottle, shows three divisions in the branchiæ at its anterior end, then two, and finally, towards the tail, only one. The branchiæ have the same character as in the foregoing fragment, and the spines and bristles seem to correspond, but of course there is room for doubt.

The tips of many of the dorsal cirri are much attenuated, and on the whole the organs are elongated. Anteriorly each foot has two strong dark brownish spines; and superiorly a tuft of stout tapering bristles with serrated edges. The brush-shaped forms have a moderately broad tip, with the lateral filament elongated on one side.

The compound or jointed bristles (Pl. XXA. fig. 21) have stout, slightly curved shafts, and the enlarged distal region is boldly serrated. The processes at the tip of the terminal piece are somewhat short; indeed in the majority of the bristles in front the fork is so abraded as to be indistinct. After mounting in Farrant's solution many present a corroded edge, and the usual parts at the tip are indistinguishable. Moreover, it is not always easy to obtain a good lateral view of these bristles, even when perfect.

The inferior hooks (Pl. XXA. fig. 22) present a strong distal process, and a comparatively short and strong inferior fang, which forms a large angle with the former.

In the intestinal pellets of the posterior fragment are brownish pigment-masses, portions of minute Crustacea, and numerous sponge-spicules.

No feature of moment is observed in transverse sections of this form. A well-marked brownish granular area occurs, apparently at intervals, in the upper region of the nerve-area.

Eunice equibranchiata, n. sp. (Pl. XXXIX. fig. 11; Pl. XXA. figs. 23, 24).

Habitat.—Dredged at Station 122B (off Barra Grande, Brazil, a little south of Pernambuco); lat. 9° 9′ S., long. 34° 53′ W.; depth, 32 fathoms; surface temperature, 77°·5; sea-bottom, red mud.

A fragmentary specimen of considerable size devoid of a head. It measures about 233 mm., with a breadth of 5·5 mm.

The body is comparatively flat throughout, and there is little to indicate tapering in the example. The dorsal wall of the body forms a flattened arch, while the ventral is marked by a deep groove. The anterior part of the fragment bears bifid branchiæ,

while posteriorly these organs are bifid. The branchia springs, along with the dorsal cirrus, from a common trunk, the main stem after a short interval giving off a very long branch, and after a somewhat longer interval, another about the same length, and then terminating in a third elongated process.

The filiform dorsal cirrus is about a third the length of the branchial process next it. The superior bristles have a long straight shaft, and the slightly winged tapering tip is bent at a distinct angle. The brush-shaped bristles are very numerous, and their extremities are peculiarly flattened (slightly spoon-shaped), and have nine or ten filaments.

The compound bristles (Pl. XXA. fig. 23) have also somewhat long shafts, with slightly curved and flattened ends. The terminal piece is rather elongated, and the edge of the guard, which runs to the base of the process, is nearly straight. The inferior fang is large, the terminal comparatively small.

The foot (Pl. XXXIX. fig. 11) has a single dark brown spine. Inferiorly are one or two hooks (Pl. XXA. fig. 24) which have an evident constriction a little below the tip. The terminal hook or process is curved, and the chief fang below comes off nearly at a right angle from the extremity.

The intestine of this form contained tough masses, which readily turned the edge of a knife, crowded with large, beautifully reticulated, translucent, and apparently homogeneous chitinous tissue. These may have been parts of the skeleton of a sponge or similar structure, especially as they were enveloped in softer granular substance.

The space between the large ventral longitudinal muscles in section is wide, probably from its posterior position. The hypoderm is of considerable thickness, and forms a curved projection externally. The neural canal lies a little above the circular muscular coat. A strong band on each side of the nerve-area, chiefly from the vertical muscle, passes downward. The somewhat thin dorsal longitudinal muscles are pierced by the vertical, an arrangement which probably causes the flattening of the body as in the leech and similar forms. A minutely granular substance, apparently male elements, exists at the bases of the feet. The alimentary canal in this region lies close above the nerve-area, the pedicle being short.

Eunice barvicensis, n. sp. (Pl. XXXIX. fig. 12; Pl. XXIA. figs. 1–3).

Habitat.—Found between tide-marks at Bermuda in June 1873.

One specimen, which is partly dried and incomplete posteriorly, measures about 48 mm., and at its thickest part in front 4·5 mm. in diameter. Two fragments of the posterior region also occurred.

From the condition of the specimen very little can be said about the head. The

tentacles do not appear to have been boldly annulated. The maxillæ (Fig. 52) are dark brown, and the basal spathulate region forms by the apposition of its halves a triangle in front and two crescentic parts posteriorly. The left great dental plate has four teeth, the right also four. Both are less deeply tinted than the maxillæ. The left lateral paired plate shows three more prominent outer teeth, and one or two less evident inner teeth. The left lateral unpaired has seven or eight denticulations. The right lateral has about the same number. A single accessory plate, acutely pointed, occurs at each side. The blackish pigment-patch below each paired plate anteriorly is unusually well defined. The mandibles (Fig. 53) are dark brownish, with the exception of the narrow dental margin in front of the dorsal line of the shaft. The ventral dental area (usually pale) has its posterior three-fourths brownish.

The branchiæ are represented on the sixth foot by a short simple filament on each side. At the tenth foot the process has three divisions; at the twentieth (Pl. XXXIX. fig. 12) there are four, which, as in the former species, appear disproportionate to the short cirrus. Two divisions occur in the branchia of the thirtieth foot; while only a single process exists on the fiftieth foot, and the latter condition appears to continue throughout the greater part posteriorly, though the state of the specimen prevents satisfactory examination.

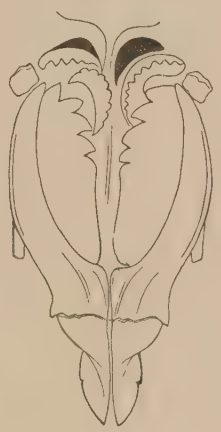


Fig. 52.

Fig. 53.

Fig. 52.—Maxillæ and dental plates of *Eunice barvicensis*, n. sp.; × 15 diameters.
Fig. 53.—Mandibles viewed respectively from the dorsal and ventral surfaces; × 15 diameters.

Each foot bears anteriorly a pair of pale brownish spines of moderate strength. About the thirtieth foot a single stout deep brown spine occurs superiorly, and a pair of long dark brown hooks inferiorly. The superior bristles have the ordinary form. The brush-shaped kinds (Pl. XXIA. fig. 1) have broad tips, with many teeth, while a series of lines from these occur on the adjoining broad region. The compound bristles (Pl. XXIA. fig. 2) have a bifid tip, the terminal division of the fork being strong.

The posterior feet have a single stout dark brown spine and a pair of long hooks. The latter (Pl. XXIA. fig. 3) are characterised by the somewhat small angle (less than a right angle) between the terminal process and the great fang, and the general contour of the tip. The hook somewhat approaches that of *Eunice challengeri*, but the other differences between the species are sufficiently diagnostic.

In the intestine of one were fragments of shells and minute Crustacea with Foraminifera. In the specimen provided with a head the pellets contained masses apparently pertaining to the Polyzoa, and sandy mud in which sponge-spicules, Diatoms, Algæ, and other debris were present.

The proportional size of the muscles in the anterior third of this species is normal. The cuticle is of average thickness, while the hypoderm forms well-marked dorsal and ventral layers, the latter tapering off at each side. The nerve-area is somewhat narrow, and presents (apparently in the intervals between the oblique muscles) a narrow median pedicle inferiorly. The neural canal is sometimes dilated between the ganglia.

In the posterior region of the body a great increase in the size of the alimentary canal occurs in transverse section. The dorsal longitudinal muscles are flattened and thin. The vertical muscular fibres pierce the inner part of each longitudinal ventral as well as bound each side of the nerve-area. Some of the vertical fibres seem to be attached to the wall of the alimentary canal, and thus may exercise an influence on its functions. The circular muscular coat of the body is largely developed and very vascular, and the hypoderm is thicker than in front. The nerve-area is rounded, and a mass of opaque granular cells lies beneath the neural canal, which is situated a considerable distance above the decussation of the muscular fibres and the circular coat.

In the shortness of the dorsal cirri and in the structure of the bristles this form approaches Schmarda's *Eunice macrochæta* [1] from the coral reefs off the southern coast of Jamaica. The ventral cirrus, however, diverges, for it is represented as a process twice the length of the dorsal. In regard to the branchiæ, *Eunice barvicensis* also resembles *Eunice capensis* [2] of the same author, but the latter organs do not occur anterior to the twentieth foot, and there is no ventral cirrus. The dentition, however, is closely allied.

Eunice pycnobranchiata, n. sp. (Pl. XXXIX. figs. 13–15; Pl. XXIA. figs. 4, 5).

Habitat.—Dredged at Station 162 (in Bass Strait, off the Australian coast), April 2, 1874; lat. 39 °10′ 30″ S., long. 146 °37′ E.; depth, 38 fathoms; surface temperature, 68°·2; sea-bottom, sand and shells.

Trawled at Station 163A, Twofold Bay, off the Australian coast, midway between Melbourne and Sydney, April 4, 1874; lat. 36° 59′ S., long. 150° 20′; depth, 150 fathoms; surface temperature, 71°·0; sea-bottom, green mud.

The largest specimen measures about 118 mm. in length and 8·5 mm. in diameter at its widest part.

The head (Pl. XXXIX. fig. 13) has two deeply indented anterior lobes, which are curiously wrinkled anteriorly and inferiorly. The tentacles are of moderate length and all boldly annulated. In the larger examples these are proportionally shorter—either from injury or otherwise. In the young specimens the median tentacle is evidently

[1] Neue wirbell. Thiere, I. ii. p. 128. [2] *Op. cit.*, p. 126.

longer. In those with the tentacular cirri best developed, the tips extend a little beyond the anterior margin of the buccal segment. There is an evident projection below the lateral notch of the buccal somite, and the inferior division forms a distinct external flap at its commencement.

The dental apparatus is dark brown. The maxillæ (Fig. 54) have a thickened external rim anteriorly. In regard to the number of the teeth on the various processes this species shows that there is a certain amount of variation. Thus the great dental plates have each four, five, or six teeth of comparatively large size. The left lateral paired plate possesses five or six teeth, the left unpaired five or seven. The right lateral plate bears from eight to ten teeth. The inferior dental surface of the mandibles (Fig. 55) presents a

Fig. 54.

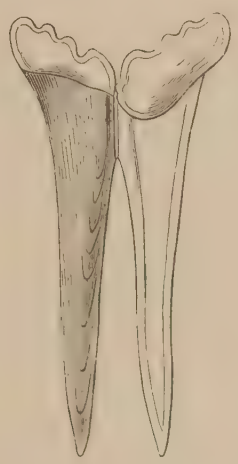


Fig. 55.

Fig. 54.—Maxillæ and dental plates of *Eunice pycnobranchiata*, n. sp. ; × 12 diameters.
Fig. 55.—Mandibles of the same form viewed respectively from the ventral and dorsal surfaces ; × 12 diameters.

distinct tooth on each side of the suture or hinge, and the anterior or cutting edge has several irregular denticulations.

The branchiæ commence on the fifth foot on each side as a single process (in the largest example it is double). There are four somewhat short, thick divisions on the tenth foot (Pl. XXXIX. fig. 14). The branchial lobes have an elongated, fusiform aspect, and are marked by transverse bars, probably from the arrangement of the blood-vessels. The twentieth foot has three branchial divisions, and the same number is found on the thirtieth. There are two divisions on the fiftieth ; and, indeed, the organs are continued almost to the tail, though they are single and much shorter than those in front. In young specimens considerable divergence in the form or structure of the branchiæ occurs, and the divisions are less numerous.

Each foot bears anteriorly two blackish-brown spines ; and between the twentieth

and thirtieth a single long brownish hook appears. The dorsal cirrus presents the usual gradation in length, from head to tail, and is on the whole rather short and thick. The anterior ventral cirri have a large tongue-shaped process.

The bristles of the larger examples are generally more or less abraded. The simple superior bristles have many adherent particles. The brush-shaped forms show about a dozen processes at the tip.

The compound bristles (Pl. XXIA. fig. 4) have a wide bifurcation, and the inferior process is small. The shafts are somewhat curved, and have fine serrations along the margin of the slightly dilated tip. In the posterior segments the shape of the terminal region of the bristle alters, the inferior fang being large and prominent, while the wing is continued upward and outward from the distal tooth by a thickened process or rib.

The dark brown inferior hook (Pl. XXIA. fig. 5) in the setigerous region of the foot has a small terminal process above a moderately large fang, the usual guard or wing being in front. The tips of the spines of the posterior feet have a peculiar clavate parasite (apparently Protozoan) growing in bunches.

In the intestine are one or two minute shells resembling *Odostomia*, and sandy mud containing sponge-spicules.

The specimens from Station 162 are somewhat less than the foregoing, and are distinguished by the pale ring bearing the second foot. This segment appears to have been white during life. The anterior region corresponds, only the tentacular cirri are shorter. The dental apparatus is similar, though the colour is less deep. The mandibular denticulations are feebly developed. The branchiæ commence on the sixth segment, and have two divisions. They are somewhat shorter throughout than in the previous examples, and their divisions less fusiform, but these differences may be due to size (Pl. XXXIX. fig. 15, tenth foot). The hooks and bristles are similar, and on the whole they may be regarded as varieties of the former. In the intestinal pellets of these are sandy mud with numerous sponge-spicules and Diatoms, and larger tough masses of a fine Polyzoon with bird's head processes.

A *pedicellaria* is fixed to the under surface of the palp of one of the Annelids.

Both cuticle and hypoderm are fairly developed. The dorsal longitudinal muscles are much more massive than the ventral. The nerve-area is rounded, and the neural canal is placed close to the circular muscular coat. The usual brownish granular mass occurs above the cords, and this differs from the contents of the blood-vessels in the more distinctly granular condition. The fine parallel transverse branches of the blood-vessels on the branchial pinnæ are well seen in this form.

The chief difference in the sections of the specimen from Bass Strait is the dilatation of the neural canal, and the massive condition of the oblique muscles. Granular masses (probably reproductive elements) occur external to the ventral longitudinal muscles and

at the bases of the feet. Extravasations of blood existed between the alimentary wall and the muscular sling surrounding it.

Eunice tribranchiata (Pl. XXIA. figs. 6, 7).

Habitat.—Dredged at Station 186 (off Cape York, Australia), September 8, 1874; lat. 10° 30′ S., long. 142° 18′ E.; depth, 8 fathoms; surface temperature, 77°·2; sea-bottom, coral mud.

A fragment of the posterior end, measuring about 48 mm. in length, with a breadth at its anterior part of 4 mm. The tail is not present. The body is somewhat flattened and comparatively soft.

Each foot bears dorsally a long branchial process of three (rarely four) divisions, the first of which comes off inferiorly, and the main stem then divides into two long and nearly equal branches. So close to the base do all these processes spring that at first sight the common stem is overlooked. To those with four divisions, however, this remark is not applicable. The dorsal cirrus is short and tapering; the ventral is also short and somewhat conical.

Dorsally in each foot is a tuft of simple tapering bristles, the wings just being visible. The brush-shaped forms have upwards of twelve filaments, one of the lateral being longer. In the compound bristles (Pl. XXIA. fig. 6) the tip of the shaft is rather abruptly bent and dilated, so that the internal striæ are oblique. The distal piece has a small terminal and a large main fang.

Besides the foregoing, each foot has a powerful blackish spine, with a curved tip superiorly. Inferiorly the two dark brown hooks (Pl. XXIA. fig. 7) have an erect terminal process and a strong main fang.

The intestinal masses contained sandy mud with a few fragments of Algæ, sponge-spicules, and Foraminifera.

The great distention of the alimentary canal had stretched both dorsal and ventral longitudinal muscles. The nerve-area is wide, and the cords thin and flattened. The vertical muscles passing from the alimentary canal to the hypoderm bound the area. These muscles enclose a somewhat triangular space, narrow above and broad below, the lower boundary being formed by the nerve-cords. An indistinct neural canal is visible superiorly, but none of the preparations show an inferior one. Indeed, some doubt remains concerning the latter point.

This form approaches *Eunice equibranchiata* from the coast of Brazil, but differs from it in the structure of the branchiæ, the minute structure of both bristles and great hooks, the latter in the Brazilian form having the main fang lengthened.

Eunice bassensis, n. sp. (Pl. XXXIX. fig. 16; Pl. XXIA. figs. 8, 9).

Habitat.—Dredged at Station 162 (off East Moncœur Island, Bass Strait, South Australia), April 2, 1874; lat. 39° 10′ 30″ S., long. 146° 37′ E.; depth, 38 fathoms; surface temperature, 63°·2; sea-bottom, sand and shells.

This fragment, consisting of about two inches of the tip of the tail and about two inches in front of it, seems to differ from any of the foregoing, and especially from *Eunice pycnobranchiata*, to which, perhaps, it appears to be most nearly related, by the very distinctly jointed dorsal cirrus (Pl. XXXIX. fig. 16), which consists of four divisions. In the former species none are visible in cirri from the same region of the body. The branchiæ are also larger, each having nine rather elongated pinnæ, whereas *Eunice pycnobranchiata* has but three very thick lobes. The ventral cirrus is also more obtuse than in the latter species, the foot of which, moreover, has blackish spines, whereas they are golden in the present form. The branchiæ are continued to the tip of the tail, being gradually reduced to a single short process. The caudal cirri are boldly segmented.

The foot bears three long yellowish spines superiorly, and inferiorly a long pale yellowish or golden hook (Pl. XXIA. fig. 9) with three distal processes, viz., a main fang and two sessile teeth superiorly.

The dorsal bristles conform to the usual type. The compound forms (Pl. XXIA. fig. 8) are characterised by a shaft devoid of superior striæ, though it has the ordinary microscopic file-like markings (from minute spines). The tip is bifid, and there would seem to be less of the alteration in the proportion of the limbs of the fork than is generally found in the posterior region of the body.

The fragment belongs to a female, and is distended with minute ova. These have a tough capsule.

The intestine contains fragments of the chitinous fibres (root-fibres?) formerly observed, branches of Polyzoan allied to *Crisia*, Ostracoda, and the usual sandy mud mixed with numerous sponge-spicules and Diatoms.

In the form of the branchiæ this species resembles *Eunice quoya*, Valenciennes (De Quatrefages).[1]

The nerve-area is somewhat trilobed in section, for there are two lateral and a smaller median lobe superiorly, but it is doubtful how far the state of the preparation may be connected with this appearance. The neural canal is inferior.

[1] Annelés, p. 318.

Eunice, sp. (?) Pl. XXXIX. fig. 19 ; Pl. XXIA. figs. 12–14).

Habitat.—A fragment of the posterior end of a somewhat flattened large form, procured between tide-marks at Bermuda, June 1873.

Each foot presents dorsally a single long branchial filament, but these organs diminish and then altogether cease a considerable distance in front of the tail. A very short and somewhat conical cirrus occurs beneath the foregoing, and extends outwards to the middle of the greatly projecting setigerous region. The ventral cirrus is also very short and broad, hardly extending so far outward as the base of the great ventral spine.

The dorsal bristles are of the ordinary type, and are accompanied by numerous brush-shaped forms (Pl. XXIA. fig. 12) presenting an elongated filament at each end (one being longer than the other). The compound bristles (Pl. XXIA. fig. 13) have the end of the shaft striated, distinctly serrated at the margin, and much dilated. The proportionally elongated terminal piece has the limbs of the fork nearly equal at the tip.

Each foot has a strong light brownish spine which pierces the apex of the greatly produced setigerous region immediately below the upper edge ; and inferiorly a single strong dark brown spine with the tip slightly curved (Pl. XXIA. fig. 14). The latter corresponds to the bifid or trifid hook usually present in other forms of *Eunice*.

The intestine is occupied chiefly by masses of brownish Algæ, amongst which are a few anchor-plates of *Synaptæ*, muddy sand and Foraminifera, with fragments of *Melobesia* and Echinoderms.

In transverse section the nerve-area lies over the circular coat, with the oblique and vertical muscular fibres as a support on each side. Superiorly an arch (enclosing the blood-vessel) is formed by the diverging muscular fibres from the alimentary canal. The fragment approaches the Onuphididæ, but it is probably a portion of one of the Eunicidæ.

Marphysa, De Quatrefages.

Marphysa goodsiri, n. sp. (Pl. XXXVIII. figs. 6–8 ; Pl. XIXA. figs. 18–20).

Habitat.—From shallow water, St. Thomas, West Indies.

The anterior portion of a somewhat small species, measuring about 2·5 mm. in diameter in front.

The head (Pl. XXXVIII. fig. 6) has the anterior lobes separated by a notch, very much as in the former species. The tentacles are rather short, and apparently slightly

annulated, though the preparation is not in good condition. The tentacular cirri reach to the anterior margin of the buccal segment, which is of average breadth. The eyes present no peculiarity.

The maxillæ (Fig. 56) have an average curve and are pale brown. The left great dental plate has four well-marked teeth, and the right also four. The left lateral paired plate shows three teeth, and the unpaired of that side the same number. The right lateral has six teeth. The latter and the left paired plate have a prominent blackish-brown band at the base ventrally. A single terminal plate exists at the end of each paired plate, so that the example may be immature. The mandibles (Fig. 57) have much elevated crowns of an obliquely conical shape, with concentric markings.

The branchiæ are represented on the twenty-fifth or twenty-sixth foot by a single long process on each side of the body. Each branchia becomes bifid about the thirty-sixth foot, the division occurring some distance above the base; and this arrangement (Pl. XXXVIII. fig. 8) continues to the end of the fragment.

Fig. 56.

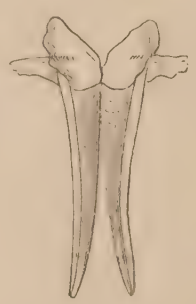


Fig. 57.

Fig. 56.—Maxillæ and mandibles of *Marphysa goodsiri*, n. sp.: × 15 diameters.
Fig. 57.—Mandibles of the same species, from the dorsal aspect; × 15 diameters.

Anteriorly the feet (Pl. XXXVIII. fig. 7) have three stout spines, the two brownish lower with somewhat curved, clavate tips, while the upper are pale and pointed. Posteriorly a single pointed brownish or blackish spine and a blackish hook (Pl. XIXA. fig. 19) occur, the great fang of the latter being directed upward and outward.

The jointed bristles (Pl. XIXA. fig. 18) have a somewhat rapid curve at the tip from the prominence of the second process, and the latter becomes longer in the posterior feet.

The superior bristles possess comparatively large and broad tips, which taper to a fine point distally. The inferior bristles of the group (Pl. XIXA. fig. 20) have proportionally broader tips.

In transverse section this species conforms to the type seen in *Marphysa sanguinea*. The nerve-cords are, however, much larger, and form a definite and somewhat massive band above the neural canal, whereas in *Marphysa sanguinea* the nerve-tissue presents the aspect of a margin to the large median neural canal. On the whole the cords are placed higher than in *Marphysa sanguinea*. The symmetrical arrangement of the muscles enveloping the great blood-vessels above the cords is not distinct in the new form.

Marphysa goodsiri somewhat resembles the *Eunice filamentosa* of Grube[1] from St. Croix, one of the Windward Islands (Antilles). The tentacles of the latter, however,

[1] Annul. Œrstediana (sep. Abd.), Bd. ii. p. 30; *Vidensk. Meddel. f. d. nat. Foren. i Kjøbenhavn*, p. 56, 1856.

are shorter. In *Eunice filamentosa* the branchiæ commence from the twenty-fourth to the thirty-fourth foot, whereas in *Marphysa goodsiri* they begin on the twenty-fifth or twenty-sixth, and in both are often bifid posteriorly. It also approaches Grube's *Eunice paupera*[1] from the Philippines, especially in the dentition. The tentacles of this form are not articulated. The branchiæ occasionally have three divisions posteriorly. About the same number (ten) are simple in each species. Another form closely connected with the present is *Eunice hamata* of Schmarda[2] from the coral reefs of the south of Jamaica. The general arrangement of the dental apparatus is similar, though Schmarda's figure of the maxillæ diverges and is apparently erroneous posteriorly. The bristles in both are allied. Schmarda mentions that the branchiæ arise in the middle of the body and consist of only two processes, and that the dorsal cirrus is short and thick. The ventral cirrus, which he says is absent, had probably been overlooked.

Nicidon, Kinberg.

Nicidon balfouriana,[3] n. sp. (Pl. XXXIX. figs. 4–6; Pl. XXA. figs. 17, 18).

Habitat.—Trawled at Station 170 (off the Kermadec Islands, north of New Zealand), July 14, 1874; lat. 29° 55′ S., long. 178° 14′ W.; depth, 520 fathoms; bottom temperature 43°·0, surface temperature 65°·0; sea-bottom, volcanic mud.

The specimen is fragmentary, the total length being about 20 mm., and the breadth 2·5 mm.

The head (Pl. XXXIX. fig. 4) bears a series of tolerably elongated and rather thick tentacles, which are slightly annulated, at intervals, the central being somewhat shorter than the adjoining pair, perhaps from injury. The palpi are separated by a deep fissure. The tentacular cirri barely reach the anterior border of the buccal segment. The latter shows only a slight forward projection at the side of the oral curve. The eyes are somewhat ovoid (the long axes being antero-posterior), and lie at the bases of the external tentacles.

The dental apparatus (Fig. 58) is pale brownish, with a few darker touches. The spathulate posterior processes have a margin of black. The maxillæ are gently curved. The left great dental plate has six teeth; the right possesses seven. The left lateral paired plate is very small, and has two or three minute teeth, the first accessory plate adjoining it having a larger area, indeed, the second is nearly as large. The first accessory on each side has a dark rim, most distinct on the straight inferior

[1] Annel. Fauna d. Philippinen, p. 160.
[2] Neue wirbell. Thiere, I. ii. p. 125.
[3] Named in remembrance of my old friend and teacher, Prof. J. H. Balfour, of Edinburgh.

border. Both accessory plates are toothed. The left lateral unpaired plate bears evidences of having eight or nine minute teeth, but the edge appears to have been injured so that only the basal grooves are distinct. The right lateral plate has about ten or eleven small teeth. The mandibles (Fig. 59) have a proportionally large dental region, the external edge of which is produced upward, and the anterior edge denticulated.

The dorsal cirri are well developed, and the same may be said of the ventral, upwards of twenty of the latter anteriorly have large ventral pads at the base.

The structure of the foot (Pl. XXXIX. figs. 5, 6) agrees with that in *Eunice*. The bristles are conspicuous by their dark colour. Anteriorly each foot has two strong brownish-black spines with slightly curved or hooked tips. Superiorly are a tuft of simple tapering bristles, and a few brush-shaped forms with somewhat broad tips.

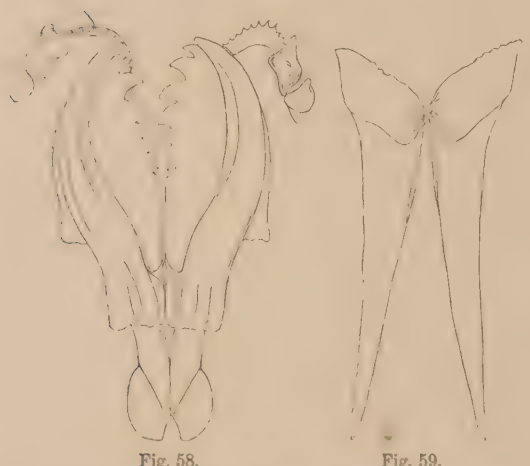


Fig. 58. Fig. 59.

Fig. 58.—Maxillæ and dental plates of *Nicidon balfouriana*, n. sp. The right lateral plate has been deprived of its boundary-line; × 20 diameters.
Fig. 59.—Mandibles of the same species; × 20 diameters.

The jointed bristles (Pl. XXA. fig. 17) have the lower part of the shaft tinted of a dark brownish hue, which fades to yellowish towards the flattened distal end. The latter is serrated on each side, and bears a terminal piece having a boldly bifid tip guarded by a serrated wing. The lower process of the bifid extremity becomes larger in the posterior feet.

Besides the two brown spines in the posterior feet is a dark brown inferior hook (Pl. XXA. fig. 18), with a powerful fang and a short process above it. The two latter are guarded by a wing on each side.

In this form the cuticle is dense and the hypoderm very feebly developed except on the appendages. The nerve-area is large and rounded, with apparently a considerable neural canal like a slit toward the lower part of the circle. The oblique muscles meet above the cords, while a muscular fasciculus passes downward on each side. The general structure is typical.

This species seems to differ from any of those described by Kinberg, all of which come from the Pacific. Grube does not appear to have fully appreciated the characters of *Nicidon*, for he places the representatives doubtfully after the Eunicidæ with articulated tentacles, which have few (not more than four) branchial filaments. The *Eunice madeirensis* of Baird (British Museum, no locality) agrees in the absence of branchiæ, but it seems to have articulated dorsal cirri, *i.e.*, they have a median constriction in the preparation. In another closely allied example from Madeira in the

same collection (British Museum), a simple and moderately elongated branchial process is developed in the posterior region of the body.

Macduffia bonhardi,[1] n. sp. (Pl. XXXIX. figs. 20–22; Pl. XXa. fig. 26).

Habitat.—Dredged off Sombrero and St. Thomas, in 470 and 390 fathoms.

A fragment of the anterior end of a peculiar form, measuring about 9 mm. in length, and little more than 1 mm. in breadth.

The head (Pl. XXXIX. fig. 20) is distinguished from any of the branchiferous series formerly described by having a smoothly rounded and entire margin, like a blunt cone, and without trace of palpi or division. It bears four smooth tentacles, a long one at each side, just within the eye, and a shorter proceeding almost from the margin of the snout a little beneath. A single and comparatively large eye occurs on each side. A considerable space devoid of processes exists in the middle line of the snout. On the ventral surface, the outline of the region resembles a horse-hoof, and has a groove in the centre, joining the transverse furrow at the mouth.

The dental apparatus (Fig. 60) presents a pair of maxillæ, which are somewhat narrowed in front. The posterior spathulate processes are unfortunately imperfect. The left great dental plate has six teeth, the right seven. The teeth on the right lateral paired plate seem to be about six or seven, and the unpaired appear to have about the same number. Those on the right lateral exceed the latter. The mandibles have a dentary surface shaped ventrally like a bivalve shell, and with a stripe of brown pigment arranged symmetrically on each side of the symphysis. Their condition is too imperfect for delineation.

Fig. 60.—Maxillæ and dental plates of *Macduffia bonhardi*, n. sp.; × 54 diameters.

The first buccal segment (for there are two) considerably exceeds the second in breadth, especially inferiorly. The succeeding five segments bear a dorsal cirrus, which is tapered from base to apex, and somewhat short and thick; a well-marked setigerous region; and a large thick, tongue-shaped ventral cirrus. The sixth, seventh, eighth, and ninth feet are alone branchiferous. The sixth has a branchial process of three divisions springing from a common trunk united with the base of the dorsal cirrus. The seventh has three or four divisions, and the eighth and ninth four each. The tenth foot (Pl. XXXIX. fig. 21) presents a somewhat short dorsal cirrus of the ordinary shape, an irregularly conical, setigerous region, and a large, lobate, inferior

[1] Named in remembrance of the late Alex. Macduff, Esq., of Bonhard.

cirrus, which projects outwards as far as the tip of the former region. A little within the margin of the latter is a blood-vessel, large below but diminishing dorsally.

The setigerous lobe bears two long brownish spines. Superiorly the simple bristles show no evident wing, though slightly dilated beyond the shaft. They taper to a fine point. The brush-shaped bristles accompanying them have rather wide tips. The shafts of the compound bristles (Pl. XXA. fig. 26) present a distinct curve below the dilatation. The terminal piece is long, and the guard or wing is bevelled at the tip, for the lower process of the fork comes off nearly at a right angle.

At the twentieth foot (Pl. XXXIX. fig. 22) the two spines of the setigerous region have become blackish, and inferiorly a brownish-black bifid hook appears. The chief fang of the latter is long, and the distal process is also well marked. The ventral cirrus forms a broad and somewhat triangular lobe.

A noteworthy feature in transverse sections of this form is the great size of the ovoid ventral longitudinal muscles, which surpass the dorsal in bulk. When sections are made through the nerve-cords in the line of the ganglia the area is large and rounded, and an indistinct canal exists superiorly, though some doubt still remains on this point. In certain very thin sections two small canals are present, but only one is well defined. The edges of the ventral longitudinal muscles almost touch in the middle line, being separated by the narrow pedicle of the nerve-area. In the general character of such sections this form approaches the Onuphididæ.

The Eunicidæ characterised by a very limited distribution of the branchiæ are *Eunice bellii*, Aud. and Ed., which is occasionally found on our own shores, and *Eunice stragulum*, Grube, from the Philippines. Kinberg likewise constituted the genus *Nausicaa*,[1] for a species devoid of tentacular cirri, and in which the short simple (cirrus-like) branchiæ were confined to the segments seven to eleven. It was found at St. José, near Panama.

Family Onuphididæ.

The Onuphididæ are fairly represented in the collection, eleven species referable to the genus *Nothria* being present, and several others, included under the genera *Hyalinæcia* and *Onuphis*. This contrasts very favourably with previous Expeditions. Thus four are described by Kinberg in the voyage of the frigate "Eugenie." This author has no example of *Nothria*, but the representatives of the genus *Diopatra* are numerous, the reverse being the case in the collection of the Challenger. The Philippine collection of Grube produced only a single member of the group, and only two occur in that of the exploring ship "Gazelle." None are given by Schmarda, and only

[1] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1864, No. 10, p. 565.

one by Marenzeller. It is noteworthy that all the representatives of the family in the collection have cirriform branchiæ.

The remarkable tubes formed by *Nothria sombreriana* and *Nothria willemoesii* are most interesting, the former utilizing the long glassy spicules of vitreous sponges, the latter forming a finely rounded tube bristled with long spines secreted by the Annelid. Even where this power of forming special spines is absent, certain species obtain the necessary protection by attaching spines of Echinoderms to their tubes.

The general structure of the dental apparatus approaches *Eunice*, but its special features rightly point to a decided distinction both from the latter and *Lumbriconereis*, even on this ground alone. The large size of the anterior fang of the left great dental plate, in those pertaining to the type of *Nothria sombreriana*, is a striking feature. Those of the same genus without this structure approach *Hyalinœcia* or *Onuphis*. The right and left anterior "lateral" plates are more nearly in symmetry, and the unpaired left has become more or less a duplicate of the great left plate, having, however, a character of its own, and not extending beyond the front of the latter. Only a single accessory plate exists.

The occurrence of several instances of soft dental plates makes it probable that ecdysis takes place, or at least renewal in some form, unless the changes are pathological or post-mortem. Sometimes the entire apparatus, including the mandibles, is soft; in a few, only the upper teeth.

The Onuphididæ are distinguished from the foregoing family (Eunicidæ) by one very evident feature, viz., their bathymetrical distribution, for while the latter are often found between tide-marks, the Onuphididæ are characteristic of deep water, many of them ranging to very great depths. Even in our own seas they frequent the deeper waters of the coralline ground; while none in the present series occurs under 100 fathoms, indeed only one (*Nothria willemoesii*) was found at this depth. Two, again (*Nothria pycnobranchiata* and *Nothria ehlersi*), come from the great depth of 2225 fathoms.

The geographical range of the common species, viz., *Nothria conchylega* and *Hyalinœcia tubicola*, is considerable, the latter especially passing from the extreme north to the warmer seas, and again to the borders of the extreme south.

Nothria, Johnston.

Nothria conchylega, Sars.

Habitat.—Dredged at Station III. (off Cape St. Vincent), January 15, 1873; lat. 37° 2′ N., long. 9° 14′ W.; depth, 900 fathoms; surface temperature, 60°·0; sea-bottom,

blue mud. Also dredged at Station 49 (south of Halifax, Nova Scotia), May 20, 1873 : lat. 43° 3′ N., long. 63° 39′ W.; depth, 85 fathoms ; bottom temperature 35°·0, surface temperature 40°·5.; sea-bottom, gravel and stones.

The tube from Station III. is composed of somewhat large fragments of shells and

Fig. 61.

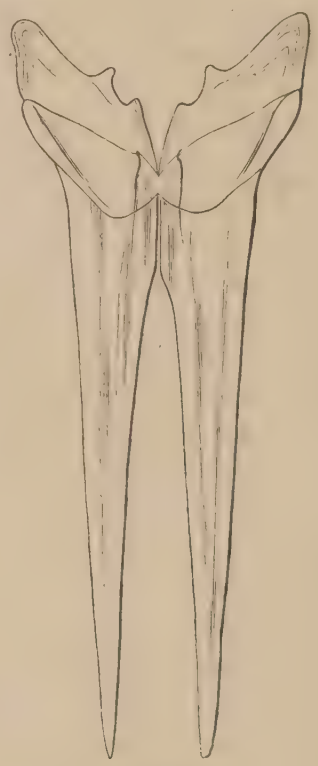


Fig. 62.

Fig. 61.—Maxillæ and dental plates of *Nothria conchylega ;* × 20 diameters.
Fig. 62.—Mandibles of the same, from the ventral surface ; × 20 diameters.

Dorocidaris, besides Foraminifera and other structures. The branchiæ commence on the tenth foot.

In the instances from Station 49, the tubes are composed of fragments of shells with a few stones, and therefore are in contrast with those from the Gulf of St. Lawrence, Canada, which (tubes) are almost wholly formed of small stones. The branchiæ commence on the eleventh segment. The egg-capsules in the mature females are beautifully and distinctly punctated.

Nothria tenuisetis, n. sp. (Pl. XL. figs. 8, 9; Pl. XXIA. figs. 24–26).

Habitat.—Trawled at Station 169 (off East Cape, North Island, New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; sea-bottom, blue mud.

A species of considerable size, measuring in its incomplete state 105 mm. in length, and having a diameter, at its widest part in front, of about 3 mm.

The head (Pl. XL. fig. 8) is eyeless. Anteriorly are a pair of frontal tentacles not unlike those of *Hyalinœcia tubicola*. The other tentacles are of considerable length, similar, though proportionally longer and more slender than in the species just

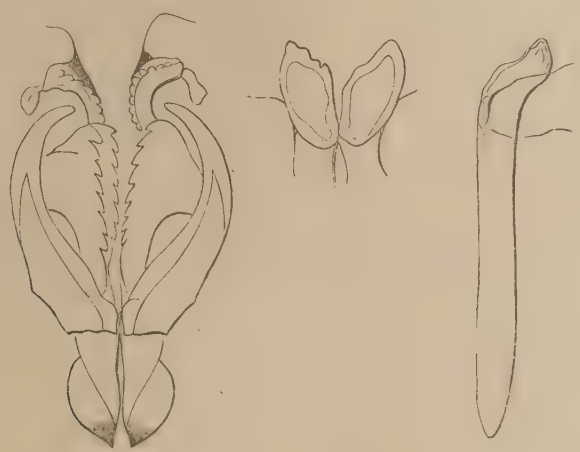


Fig. 63. Fig. 64. Fig. 65.

Fig. 63.—Maxillæ and dental plates of *Nothria tenuisetis*; × 20 diameters.
Fig. 64.—Ventral view of the cutting edges of the mandibles of the same; × 20 diameters.
Fig. 65.—Dorsal view of one mandible; × 20 diameters.

mentioned. The ringed basal region in each is also somewhat longer. The tentacular cirri are slender and filiform, and extend beyond the frontal region. The two palpi correspond in size with those of *Nothria conchylega*.

The dental apparatus (Fig. 63) is of a dull straw colour, with brown bands and lines along the margins. The flattened posterior region of each maxilla is pale, the anterior brownish. The lateral curvature of the limb is well marked, but only a slight dip (downward) occurs in front of the transverse line. The shape of the posterior processes differs in the two examples. In the most perfect the processes are constricted behind the transverse line of the maxillæ, then bulge outward and form a rounded extremity with a median notch. The posterior margin and side are tipped with dark pigment, leaving a symmetrical and somewhat triangular median region on each side. In the other example the outer dark region just described extends further forward, and is

wrinkled and uneven. The median triangular areas are similar to the foregoing. The left great dental plate shows seven, the right seven or eight teeth. The left lateral paired plate has six teeth, and outside is an accessory plate with a conical tooth. The left unpaired lateral has eight teeth. The right lateral has eight or nine teeth, and the accessory plate also has a pointed tooth. Beneath the paired plate on each side is a blackish-brown alveolus. The mandibles (Fig. 64) are slightly fixed at the base of the dental surface, which is petaloid, with the broad end of the lobe directed forward and irregularly denticulated on the edge. On the dorsal surface (Fig. 65) a short dark line occurs on each side of the fissure towards the posterior region of the dental surface.

This species differs from *Nothria conchylega* in the structure of the first foot, and it is much less produced anteriorly. The foot has a dorsal cirrus, a broader though shorter process from the posterior border of the setigerous lobe, and a ventral cirrus, the tip of which does not extend so far outward as the latter. This type continues in five or six feet, and a few then show only the dorsal and ventral cirri. About the ninth or tenth (occasionally the eleventh) foot each branchia commences in connection with the base of each dorsal cirrus as a simple filiform process, which increases in length to the twentieth, by and by becomes bifid (Pl. XL. fig. 9), and again forms a simple process before reaching the fortieth foot. It appears to continue in the latter condition till near the tip of the tail, though no specimen is complete. The ventral cirrus disappears about the tenth foot.

The bristles of the first foot (Pl. XXIA. fig. 24) are peculiar in showing a large terminal and two smaller inferior fangs, besides an articulation of the terminal region as in *Sthenelais*. The latter is also seen in an elementary condition in *Nothria sombreriana*.

The superior bristles are characterised by their great length, translucency, and finely tapered condition. The wing or guard is just distinguishable at the margin. At the twentieth foot they form a dense tuft, which projects considerably. The inferior bristles of this kind, again, have short though acutely pointed tips and short shafts.

Two prominent hooks occur inferiorly before reaching the thirtieth foot. These (Pl. XXIA. fig. 25) have a powerful inferior fang, and a well marked superior one which indicates, by its forward curve, the condition in allied forms, in which both are nearly equal in length. Moreover, posteriorly the proximal fang increases in size (Pl. XXIA. fig. 26).

No trace of a tube occurs in the preparation, with the exception of a minute, translucent soft chitinous one, which may be unconnected with the specimen.

Some of the fragments pertain to females, and are full of ova.

The minute intestinal masses consisted chiefly of greyish sandy mud, with a few Diatoms, minute bristles of Annelids and fragmentary spicula, apparently of Sponges.

In transverse section the nerve-area differs from that in *Nothria conchylega*, Sars, for the cords lie close to the circular coat, and are completely wedged in by two lateral

bands of fibres from the alimentary canal, and the connective tissue which surrounds the great median blood-vessel immediately above them. No neural canal is visible. The oblique muscles are very slightly developed, and the contrast with the typical species in this respect is marked. The ventral longitudinal muscles are massive and elongate-ovoid in section, whereas the smaller dorsal muscles are ovoid. The alimentary canal is fixed to the median dorsal wall almost without a pedicle, and a considerable blood-vessel occurs at each side. A similar pair of vessels lie close to the wall of the intestine above the great ventral. The nerve-cords are much flattened, and the difference between them and the ganglionic enlargements is pronounced.

The *Tradopia maculata* of Dr. Baird,[1] from Madras, possesses bifid branchiæ anteriorly, but posteriorly the divisions are more numerous. A species procured by Mr. Whiteaves, in the Gulf of St. Lawrence, is closely allied to the present form, but differs in the great length of the ringed bases of the tentacles.

A specimen dredged off Sombrero and St. Thomas, either in 460 or 390 fathoms, but which locality is doubtful, approaches the foregoing so closely that it has not been thought necessary to form a new species. It is fragmentary, measuring about 20 mm. in length and 2·3 mm. in breadth.

The head has lost its tentacula, their basal-regions, which seem to be large, alone remaining. The tentacular cirri are filiform and of considerable length. The frontal lobes are elongate and ovate. The general aspect of the maxillæ agrees with *Nothria tenuisetis*, but the posterior appendages have a straight instead of a convex outer edge, the latter indeed, being parallel to the line bounding the inner triangles, and the centres are somewhat more tumid. The pigment is thus in the form of a straight band on each side. The left great dental plate has eight teeth, the right nine. The left paired plate possesses five teeth, and the accessory (as on the right) has a tooth. The left unpaired shows about nine, and the right lateral seven teeth. The same blackish pigment is present on both sides, in the alveolus of this and the corresponding plate on the left, as in the previous examples. The mandibles also agree with those in the latter in regard to the black lines on each side of the fissure, and in the irregular denticulations along the anterior (cutting) margin.

A slight divergence occurs in the origin of the branchiæ, which appear on the seventh foot instead of the ninth; moreover, the bifid condition continues somewhat further backward. The organs are also shorter, but the condition of the specimen is unsatisfactory, and therefore such characters are unreliable.

In transverse section this corresponds with the foregoing in the general shape of the body, and in the proportions of the dorsal and ventral longitudinal muscles. The vertical muscles passing by the side of the alimentary canal are, however, much stronger, for considerable bands pass to the hypoderm on each side of the nerve-area. A large

[1] *Proc. Linn. Soc. Lond.*, vol. x. p. 355.

neural canal lies below the latter. The oblique muscles, though slender, are more conspicuous than in the previous examples. The longitudinal ventral muscles seem to be pierced by certain fibres passing from the dorsal arch to the outer side of the longitudinal muscles of the region. The structure, though closely allied, is thus not identical with the form just described.

Nothria sombreriana, n. sp. (Pl. XL. figs. 5–7; Pl. XXIA. figs. 19–23).

Habitat.—Dredged off Sombrero and St. Thomas, West Indies, in 470 and 390 fathoms, 1873.

The larger specimen (in two pieces) measures about 43 mm., and has a breadth across the feet anteriorly of barely 2 mm.

The head (Pl. XL. fig. 6) is marked by brownish pigment, which extends into most of the tentacles. The median tentacle is moderately elongated and tapered, and slightly exceeds the adjoining pair in length. The latter have a similar shape and appearance. Both sets rise from a base possessing a few rings. The basal segment of the outer pair is smaller, but is similarly ringed. The organs themselves are only about a fourth the length of the foregoing inner tentacles, are less tapered, proportionally thicker, and more curved. The tentacular cirri are short and tapering. The palpi differ from those of *Nothria conchylega* in being more globular. No eyes are present.

The dental apparatus (Fig. 66) is comparatively pale in the smaller forms, more dusky in the larger, the chief coloration being a dark transverse line separating the posterior (spathulate) processes from the maxillæ, and a symmetrical touch of the same hue on the great plates a little in front of the fork of the latter. The maxillæ have the posterior part of the blade flattened, the anterior diminished somewhat suddenly; while the latter region is tinted brownish. The posterior appendages are somewhat triangular, and considerably shorter than in *Nothria conchylega*. The left great dental plate has six teeth, ten being present in the form just mentioned; the size, prominence, and separation of the first three being remarkable, and a feature apparently characteristic of the series (Fig. 68), indeed at first sight the left side seems to be furnished with two maxillæ, so prominent is the elongated anterior hook of this plate. In the large examples there are seven or eight teeth. The right plate has eight teeth. The left lateral paired plate presents seven or eight teeth, and the accessory has a single blunt tooth. The unpaired of the same side has eight teeth. The right lateral plate has about ten teeth. The ventral dental surface of the mandibles (Fig. 67) has a prominent ledge on each side behind the crown. The corresponding ledges form a broad V, with a pigment-line round the posterior margin (Fig. 69). The cutting edge or crown is armed with two or three prominent denticulations, sometimes symmetrically disposed. A longitudinal line of dark pigment occurs on the dorsal surface on each side of the

median fissure. The limbs of the mandible are ankylosed at the point of junction

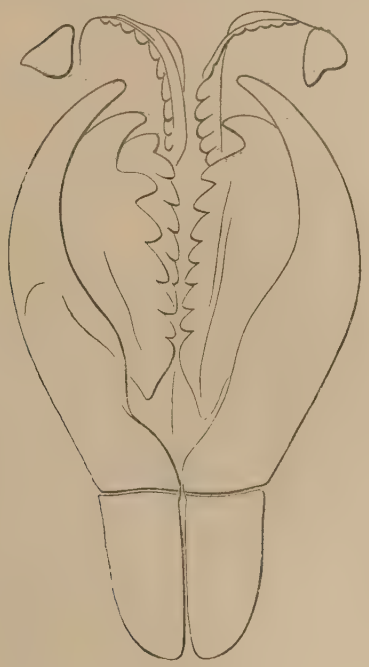


Fig. 66.

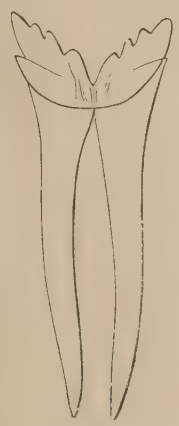


Fig. 67.

Fig. 66.—Maxillæ and dental plates of *Nothria sombreriana* ; × 54 diameters.
Fig. 67.—Mandibles of the same, from the ventral surface ; × 15 diameters.

anteriorly, and shortly behind the curved pigment-band are separated by a considerable

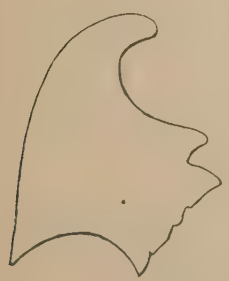


Fig. 68.

Fig. 69.

Fig. 68.—Left great dental plate (soft) of another example ; × 20 diameters.
Fig. 69.—Dental margins of the mandibles exhibiting the ledge behind the crown ; × 54 diameters.

interval. There is a deposit of dark brown pigment in the anterior part of the shafts, chiefly noticeable on the ventral surface.

A remarkable condition exists in one of the larger forms (in a tube covered by *Globigerinæ*), for the entire dental apparatus, with the exception of the mandibles, is soft and pale, so as to resemble a Crustacean shell after ecdysis. The latter process, however, has hitherto been unknown in this group. The tips of the maxillæ are boldly curved and very flexible, and the posterior part is much flattened. The first tooth of the left great dental plate is characteristically elongated, but its soft condition causes abnormal curvatures. A black line occurs between the maxillæ and the posterior processes, which are separated by a considerable interval. There is nothing in the appearance of the Annelid denoting such a change, and the mandibles are quite dense.

The first foot bears a series of bristles (Pl. XXIA. fig. 19), characterised in the older specimen by a somewhat blunt and large terminal process, beneath which is a small tooth that likewise is blunt, probably from wear. In younger forms a more perfect condition of the tip is noticeable (Pl. XXIA. fig. 20), both as regards the bifid process and wing. An oblique line near the tip probably indicates a rudimentary articulation.

The feet in general (Pl. XL. fig. 7) are similar to those of *Nothria conchylega*, but the accessory and other ventral cirri in front are less conspicuous. Anteriorly the entire foot, moreover, is less produced, especially the setigerous region, while the bristles are much longer. The dorsal bristles (Pl. XXIA. fig. 21) are more delicately "winged" than in the common form; and the brush-shaped kind (Pl. XXIA. fig. 22) are proportionally broader at the tip.

The hooks again (Pl. XXIA. fig. 23) differ considerably in the curve at the end of the shaft, and in the nature of the bifurcation. The distal fang is more elongated and less robust than in the European form. Two or more occur in each foot.

The absence of branchiæ further distinguishes the present species from *Nothria conchylega*, and the body is much more friable than in the latter.

The posterior feet present near the base on the dorsum a prominent papilla anteriorly and another posteriorly, apparently connected with the body cavity. In this region also the spines of the feet are more prominent, and the lower fang of the hook larger.

On the ventral surface a central prominence in each segment occurs behind the anterior third.

The tube formed by this species is somewhat flaccid, flattened, and nearly opaque. It is supported along each edge by the long glassy spicules of a Hexactinellid Sponge (Pl. XL. fig. 5). The tip of the spicule projects considerably (7–9 mm.) at each end of the tube, but on opposite sides, as shown in the figure. The tube measures about 58 mm., and is quite straight. In structure it is thus intermediate in position between *Hyalinœcia* and *Nothria*, being devoid of the rigidity of the former, and the abundant extraneous bodies of the latter. One of the larger tubes is covered with *Globigerinæ*, and with a single long spicule at the side. Another has a few *Globigerinæ* scattered over a wall composed of greyish mud, and strengthened by a long spicule passing from

end to end. It is remarkable that all possess a spicule or spicules. These tubes evidently correspond with one found by Count Pourtalès off Havana,[1] and which he describes as white, parchment-like, straight, and flattened. It was densely armed with spicules of sponges placed transversely, and stiffened by the long threads of a *Hyalonema* attached longitudinally. Only a fragment of the inhabitant was found.

In section no very evident distinction between this and *Nothria conchylega* is observed, the chief point being the thicker circular coat and the more complete decussation of the oblique muscles below the cords. The great size of the nerve-cords and ganglia in the small (young ?) examples is noteworthy.

This form differs in the structure of the feet from such as *Onuphis setosa*,[2] Kinberg, from the Atlantic, off the estuary of the Rio de la Plata, for though the latter has only a single branchial process, it arises in common with the dorsal cirrus. The presence of a long ventral cirrus in the *Onuphis fragilis* of the same author is also diagnostic.

Nothria sombreriana, n. sp. var. ?

A minute fragmentary form, measuring about 9 mm. in length and having a diameter of half a millimetre, was dredged with *Nothria sombreriana*, and though at

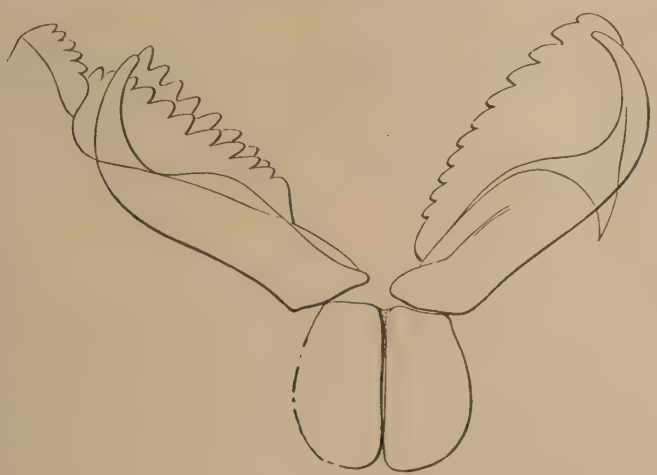


Fig. 70.

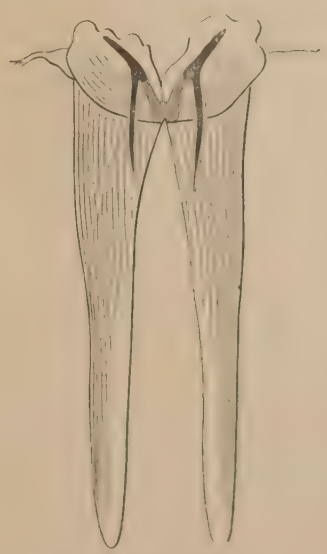


Fig. 71.

Fig. 70.—Maxillæ and mandibles of *Nothria sombreriana*, n. sp. var. ? widely separated; × 90 diameters.
Fig. 71.—Mandibles of the same, from the ventral aspect; × 90 diameters.

first it was thought to be a young variety furnished with a pair of very distinct eyes, a closer examination makes its separation probable. Each eye is situated below and

[1] *Bull. Mus. Comp. Zoöl.*, vol. i. p. 109; also alluded to by Ehlers, *Ibid.*, vol. v. p. 273.
[2] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1864, p. 560.

slightly posterior to the lateral tentacle (next the median). In regard to the structure of the dental apparatus (Fig. 70), this minute form differs from the previous species in the greater breadth of the posterior plate of the maxilla, and the narrower and more distinctly curved anterior region. The posterior spathulate appendages approach the shape of a double cocoa-nut. The left great dental plate has eleven teeth, and the same number appears on the right. Moreover, the first series on the left (about three) does not show the separation and special development characteristic of the former species. Such a divergence is not altogether due to age. The left lateral paired plate appears to have about eight, while the left unpaired has twelve distinct teeth. The right lateral shows about eight, but this and the left paired could not be distinctly enumerated. The mandibles (Fig. 71) have the cutting surface less developed, presenting a simple convex edge, with a notch at the external angle. The longitudinal blackish band on each side of the fissure is much more distinct as well as more evidently symmetrical. It bends inwards anteriorly to a thick angle, and then proceeds backward with a slight curve. The ventral dental surface forms a broad V.

The bristles of the first foot seem to be nearly related to those of *Nothria sombreriana*. In the present minute form the bristles possess broader wings, and the tips of the long hooks differ in having shorter forks.

The structure in transverse section corresponds with the plan of the typical form, though the ventral muscles bulge downward on each side of the median line. The size of the nerve-cords would indicate that the specimen is young. The body is less flattened than in *Nothria conchylega*, and the muscular environment of the ventral longitudinal muscles less distinct. The neural canal occupies the same position.

Nothria abranchiata, n. sp. (Pl. XL. figs. 10, 11, 12; Pl. XXIA. fig. 27; Pl. XXIIA. figs. 1–3).

Habitat.—The larger examples were trawled at Station 156 (Antarctic region), February 26, 1874; lat. 62° 26′ S., long. 95° 44′ E.; depth, 1975 fathoms; surface temperature, 33°·0; sea-bottom, Diatom ooze.

Also at Station 335 (in the middle of the Atlantic, north of Tristan da Cunha), March 16, 1876; lat. 32° 24′ S., long. 13° 5′ W.; depth, 1425 fathoms; bottom temperature 37°·0, surface temperature 73°·5; sea-bottom, Pteropod ooze.

The species appears to be of considerable size, the breadth of the last-mentioned example being fully 5·5 mm. across the anterior feet.

The head (Pl. XL. fig. 11) agrees generally with that of *Nothria conchylega*, but the frontal tentacles are notably shorter. The median and other tentacles, again,

are somewhat longer than in the European form. The tentacular cirri are also longer and more slender. The two rounded prominences on the ventral surface of the snout are less elongated. No eyes are visible. The latter feature, not unusual in Annelids from great depths, is further qualified by the fact that the eyes of the common form are often pale.

The dental apparatus (Fig. 72) is unusually dense, and more or less brownish according to age. Five blackish lines (running along the borders of adjoining parts) converge at the junction of the maxillæ posteriorly, and there is a deep blackish band below each lateral paired plate. The maxillæ and great plates are here and there marked with a superficial whitish deposit. The maxillæ show a distinct constriction posteriorly, then

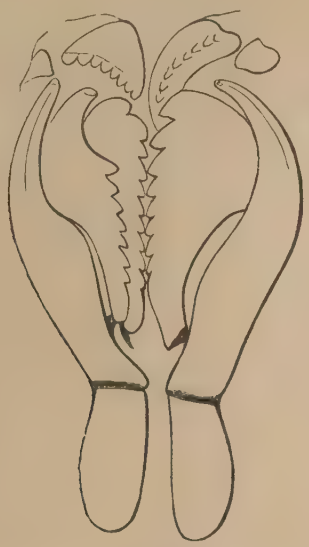


Fig. 72.

Fig. 73.

FIG. 72.—Maxillæ and dental plates of *Nothria abranchiata*, n. sp., from Station 335, separated posteriorly; × 20 diameters.
FIG. 73.—Ventral view of the mandibles of the same; × 20 diameters.

enlarge into flat plates and again diminish anteriorly, where the curve is moderate. The tip of each has a thick outer fold. A very marked angle occurs between the maxillæ and the posterior appendages, which bend abruptly downward. Each appendage has a pale basal triangular piece and an outer broad brownish portion, somewhat undefined externally. The left great dental plate has a great anterior fang followed by six or seven smaller teeth, while the right shows ten or eleven. The left lateral paired plate has eight, and an isolated accessory plate rises into a single prominent tooth. The unpaired plate of the same side presents ten or eleven teeth. The right lateral plate has about ten teeth. The dental portion of the mandibles (Fig. 73) usually presents from the ventral aspect a somewhat lanceolate outline on each side, the outer anterior extremity being produced and pointed. The cutting edge shows a few denticles.

In the older forms a dark pigment-line runs along the external and posterior borders, which are likewise considerably thickened by deposition of calcareous material. In the largest example the anterior margin of the mandibles is nearly transverse and much truncated, probably either from wear or injury.

The two segments following the buccal differ from the succeeding, in so far as the ventral cirri have been less modified, the somewhat lobulated cirrus in each being very readily distinguished from the flattened scute on the third foot.

The first foot differs from that of *Nothria conchylega* in being much shorter. It is thus less conspicuous in its anterior projection. The flattened posterior lamella so characteristic of the common species is absent. The blunt hook-shaped bristles (Pl. XXIA. fig. 27) are much larger, and the terminal curve less abrupt. The tip has a blunt hook and a short process beneath. This foot, as in the ordinary form, bears a shorter dorsal cirrus than in the next segment. The ventral cirrus, again, is represented by a shorter and more globular process than in the European species, the accessory inner cirrus (close to the mouth) being also much shorter and broader. The other dorsal cirri anteriorly appear to be larger and longer, while the ventral are somewhat less. The disc-like processes are better marked. The bristles of the first foot are imperfect in the specimen from Station 335.

A characteristic feature of this deep-sea form is the much greater length of the bristles, which project boldly on each side. Moreover, no branchiæ are present.

Each foot (Pl. XL. fig. 12) has generally about three long straight dorsal bristles with rather short and slender tips (Pl. XXIIA. fig. 1), and a number of small brush-shaped forms, the extremities of which are curved so as to resemble a funnel with a spinous edge. Inferiorly is a group (generally five) of more slender bristles with wings (Pl. XXIIA. fig. 2). A single long hook (Pl. XXIIA. fig. 3) occurs at the tenth foot, and a pair subsequently. The tip is deeply bifid, and the inferior fang slightly exceeds the superior in size. Lastly the foot, which is on the whole thicker than in *Nothria conchylega*, is supported by four spines.

Posteriorly the bristles diminish in strength, while the hooks are somewhat stouter. The tail is terminated by two long filiform cirri.

The antarctic tubes are somewhat flexible, the outer surface being coated with greyish mud (Diatom ooze), and strengthened with specimens of a long, moniliform, brownish, arenaceous Foraminifer, which is chiefly attached to the sides, after the manner of the large glassy spicules observed in *Nothria sombreriana*. A large *Zoanthus* and a fragment or two of micaceous stone are also present. The chitinous lining of the tube is easily torn.

The tube from the depths of the Atlantic (Pl. XL. fig. 10) measures about 100 mm. in length, and is composed of a thickish and rather friable secretion, coated with greyish foraminiferous mud, strengthened by spatangoid spines (which project outwards on each

side), shells and stones. Conspicuous amongst the shells are a rare *Dentalium*, *Aporrhais*, *Bulla*, *Terebratula*, and the long valve of a Cirriped, resembling the tooth of an *Echinus*. The first-mentioned appropriately forms the tail. The smooth surface of the tube with the spatangoid spines projecting at right angles seems to have lain on the bottom, while the dorsal and lateral surfaces are protected by the comparatively large shells and stones.

In the intestine of the antarctic form are masses chiefly composed of the chitinous cuticle of small Crustacea with various appendages enveloped in Pteropod ooze. In the alimentary canals of those from the Atlantic, foraminiferous mud and cellulo-granular debris of a pale olive colour occurred.

Transverse sections of the anterior third of the body-wall of a large example (Station 156) present great dilatation of the alimentary canal, and the ventral longitudinal muscles are much flattened. The nerve-cords also form a thin band in the obtuse angle over the commissure of the oblique muscles. So great is the development of the circular muscular coat over the dorsal region that it is in many sections as thick as the dorsal longitudinal, and the contrast between the two arches (dorsal and ventral) is thus striking, for the circular layer forms but a thin band inferiorly. The body-wall is less stretched in the specimens from Station 156, and the nerve-area proportionally larger (the Annelids being considerably less); but the general features are the same. As in *Nothria conchylega*, the dorsal longitudinal muscles are pierced by the vertical fibres, often in a somewhat symmetrical manner. No neural canal is visible in this or the first-mentioned preparation, but neither is in a very satisfactory state.

The absence of the branchiæ in this species is remarkable. It would seem, however, that the comparative length of these organs in other members of the group is subject to considerable variation, a fact of moment in examining into the specific differences of such forms as Hansen's *Nothria hyperborea*,[1] which some think is a mere variety of *Nothria conchylega*.

Nothria pycnobranchiata,[2] n. sp. (Pl. XL. figs. 13, 14, 15; Pl. XXIIA. figs. 4, 5).

Habitat.—Trawled at Station 298 (off the Chilian coast), November 17, 1875; lat. 34° 7′ S., long. 73° 56′ W.; depth, 2225 fathoms; bottom temperature 35°·6, surface temperature 59°·0; sea-bottom, blue mud.

The same form occurred in the trawl in equal numbers at Station 299 (between Juan Fernandez and Valparaiso), December 14, 1875; lat. 33° 31′ S., long. 74° 43′ W.; depth, 2160 fathoms; bottom temperature 35°·2, surface temperature 62°·0; sea-bottom, blue mud.

[1] Den norske Nordhavs-Exped., Bd. vii. p. 32, Tab. iv. figs. 5–13.

[2] πυκνός, thick.

A species of considerable size, though no example is complete, probably because special care is necessary in preserving specimens in dense tubes. The length of the form is about 70 or 80 mm., and the breadth anteriorly 8·5 mm.

The head of this species is very similar to that of *Nothria abranchiata*, the external (short) tentacles and the tentacular cirri being perhaps a little shorter. No eyes are visible.

The dental apparatus (Figs. 74, 75) is dull madder brown. The angle formed by the posterior appendages with the maxillæ is much less than in the former species, so

Fig. 74.

Fig. 75.

Fig. 76.

Fig. 74.—Maxillæ and dental apparatus of a male specimen of *Nothria pycnobranchiata*, n. sp.; × 15 diameters.

Fig. 75.—Maxillæ and dental plates of a female example, about the same size as the former. The posterior spathulate plates have been bent downward, and therefore are not fully shown; × 15 diameters.

Fig. 76.—Ventral view of the mandibles of the latter specimen; × 15 diameters.

that the processes are more easily seen from above. A male (Fig. 74) showed considerably longer maxillæ than any of the females (Fig. 75), indeed the whole apparatus had a longer antero-posterior diameter. The widening above the base of the maxillæ is less pronounced. The posterior appendages have a triangular basal part, and a convex marginal region. The rounded posterior border has a median notch. The left great dental plate presents the usual long anterior fang, which is followed by eight teeth; the right has ten. The left lateral paired plate has eight or nine teeth, and the accessory a single tooth (rarely double); the unpaired nine teeth. The right lateral possesses ten teeth. In the female the maxillæ seem to be shorter and broader, but the teeth on

the various plates are almost identical in number. Ventrally the dental surface of the mandible (Fig. 75) presents a somewhat petaloid appearance, the anterior external angle being much produced and pointed, and the cutting edge is slightly denticulated. Moreover, the outer margin is marked by a shoulder or projection at the point where a nearly transverse ridge indicates a thickened plate covering the posterior moiety. A slight band of dark pigment occurs along the posterior margin of this dental surface. The separation of the special dental process from the end of the shaft is well seen on the dorsal surface. The dental region of the mandibles of those from Station 299 varied in regard to the posterior raised plate, and the anterior denticulations. The dental apparatus is thus on the whole closely allied to that of the previous form, one of the most evident distinctions, however, being the larger angle formed by the posterior appendages with the maxillæ.

The anterior dorsal cirri are shorter and stouter than in *Nothria abranchiata*. Moreover, at the seventeenth foot a thickish branchial process makes its appearance, and continues a considerable distance, but not to the posterior end of the Annelid. The first ventral cirrus is enlarged and lobulated, and the second still more so, while the third forms a flattened scute-like process.

So far as examined, the bristles of this form and *Nothria abranchiata* approach each other very closely, and upon this ground difficulty was at first experienced in separating them. A closer examination, however, showed that the hooks toward the twentieth foot in this species have shorter limbs to the fork (Pl. XXIIa. fig. 5), and the curvature at the tip differs.

The bristles of the first foot present a blunt hook at the tip (Pl. XXIIa. fig. 4) with a process beneath. The curve of the distal region is bow-like, and the central striæ are oblique throughout a considerable distance.

The lateral regions of the posterior segments are marked superiorly by curious projecting folds. Two long caudal cirri occur beneath the corrugated anus.

The fæcal pellets are very firm. In the specimens from Station 298 they consist of a tenacious greyish mud in which are a few Foraminifera, minute spicules and microscopic ovoid bodies. In those from Station 299 the pale brownish masses of mud showed fragments of minute Crustacea and Foraminifera.

The tubes are flattened dark greyish structures, consisting of a basis of chitinous secretion coated with mud, and strengthened both dorsally and ventrally by long cylindrical brownish tests of Foraminifera, and a few white tubes pertaining to the Serpulidæ. These tubes range on each side of 140 mm. in length, and have a diameter of about 12 mm. at their wider portions. They are often flattened, indeed their posterior end is generally so. Some have various parasitic Polyzoa attached to them. They are frequently marked by numerous transverse ridges of chitin, projecting through the mud. In a few the front of the tube has fragments of shells and other

debris projecting from it, so as to make an irregular margin. Some of the empty tubes are quite flaccid. It is curious that what appears to be the lower surface of the tube is specially coated by the foraminiferous tests, the long axes of these being parallel with that of the tube. The tests are firmly adherent.

In a large specimen from Station 298 the body-wall is greatly distended by the male elements, very large masses of sperm-cells filling up the whole area around the alimentary canal except the median dorsal and ventral attachments. The latter consists of a strong band of muscular fibres passing downward on each side of the nerve-area to the circular coat, and forming a hollow arch over the area, which is comparatively small. In an example from Station 299 the body-wall more closely approached the typical form, except in the absence of the neural canal.

Nothria macrobranchiata, n. sp. (Pl. XLI. figs. 1, 2, 3; Pl. XXIIa. figs. 6, 7).

Habitat.—A few specimens were dredged at Station 232 (south of Yedo, Japan), May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature 41°·1, surface temperature 64°·2; sea-bottom, green mud.

When removed from the tube the Annelid measures 78 mm. in length, and at its widest part is nearly 6 mm. across the feet. The posterior region, however, seems to be

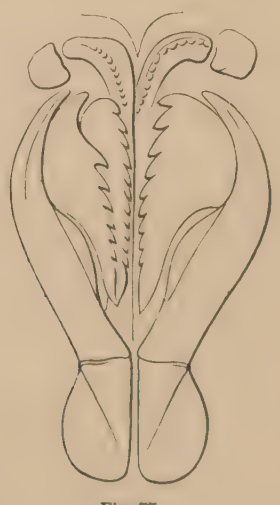


Fig. 77.

Fig. 78.

Fig. 77.—Maxillæ and dental plates of *Nothria macrobranchiata*, n. sp.; × 24 diameters.
Fig. 78.—Ventral aspect of the mandibles of the same; × 24 diameters.

undergoing regeneration, so that it is probably longer. It is thus much longer in proportion to its tube than any of the others.

The body is slightly narrowed in front, then maintains a nearly uniform diameter throughout the greater part of its length. Towards the tail it again tapers.

The head (Pl. XLI. fig. 2) is furnished with moderately elongated tentacles, the median being shorter than the adjacent. From the shape of the head the bases of the external tentacles are carried further forward than in the common form (*Nothria conchylega*). The frontal tentacular lobes are similar. The tentacular cirri are about the same length.

The dental apparatus (Fig. 77) is pale madder-brown, with darker touches in the usual positions, and a blackish-brown band between the maxillæ and the posterior processes. The maxillæ are distinctly widened in the middle. The posterior appendages have the same inclination as in the last species, are slightly contracted behind the maxillæ, and then form broad plates without a median notch posteriorly. The left great dental plate has six teeth behind the long anterior fang, the right nine teeth. The left lateral paired plate possesses ten, and the unpaired eleven teeth. The right lateral shows ten. A single, somewhat rectangular, accessory plate exists on each side. Its anterior and inner edge rises into a small blackish tooth. The rest of the surface is pale brownish. The mandibles (Fig. 78) have about three prominent denticulations along the cutting edge, and the posterior dental region is separated by a transverse or slightly oblique line as in the former species.

The post-buccal region consists of two segments, the posterior having the larger and more lobate ventral cirrus.

The first pair of feet are directed as far forward as in *Nothria conchylega*, but differ in having no median cirrus, while possessing both dorsal and ventral cirri and a setigerous flap. The bristles (Pl. XXIIa. fig. 6) have a somewhat abruptly curved tip, with a hooked terminal fang, and a broad, pointed process immediately beneath. The wing extends considerably above the former, and also runs into the shaft very gradually.

The branchiæ are represented in some on the eighth foot by a small process. The ninth has a well developed, long, simple branchia; and they continue of the same shape nearly to the posterior end of the body, the exact arrangement at the tip of the tail being unknown, since the specimens are imperfect. The branchial processes are, indeed, conspicuous features, the long, tapering filaments being about a fourth less than the diameter of the body, and often gracefully coiled at the tip. At the tenth foot the branchia is considerably longer than the dorsal cirrus; at the twentieth it is more than twice as long as the latter, and throughout (Pl. XLI. fig. 3) it is much larger and thicker, though this condition depends to some extent on the state of the blood-vessels.

Dorsally is a group of the ordinary long bristles with straight shafts, and curved and finely tapered tips; then two long, stout hooks (Pl. XXIIa. fig. 7), which have a slight curvature backward at the tip, and two strong fangs of nearly equal size, as in the *Onuphis eerugreni* of Kinberg.[1] In all these hooks the wings form a symmetrical pair

[1] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1864, p. 560, Taf. xiv. fig. 8 (Freg. Eugen. Resa).

when the tip is viewed directly in front or behind. Both anterior and posterior hooks are very prominent, generally reaching, in the preparation, the ends of the shafts of the dorsal bristles. The ventral bristles are similar to the dorsal, only more slender.

The greyish pellets (which abounded in the intestine) consisted of finely granular mud loaded with multitudes of Diatoms, most being linear, Crustacean hairs, fragments of cuticle, and a very few minute Foraminifera.

This species occupies tubes of greyish mud, lined by the usual tough secretion, and strengthened by the long linear leaves of pines, pieces of leaf-stalks and leaves, straws, stones, fragments of Echinoderms, and other structures. The linear leaves of the pines are arranged longitudinally, as in the case of the needle-like spicules of the Hexactinellid sponge. Moreover, as usual, one surface of the tube is better protected than the other, so that the latter is probably the lower surface, though this is uncertain. The longest tube measures about 80 mm., and has a diameter of 6 mm. at its wide part. A portion of a linear leaf, however, projects beyond the aperture. The tube is slightly tapered from before backward, and somewhat curved. Although in some cases there are two linear leaves of the pines, only one is attached to the tube, showing that a rude exterior was important, or that full advantage was not taken of the structure.

In transverse section of a female both dorsal and ventral muscles are somewhat flattened, partly from the distention of the perivisceral chamber by large and small ova. The disproportion between the dorsal and ventral arches of the circular muscular coat is not so marked as in several of the previous forms. The strong oblique muscles pass to the circular coat inferiorly, but do not decussate, the rounded nerve-cord occupying the space between them, and presenting a small median neural canal. The usual muscular arch of fibres from the alimentary canal occurs superiorly. A ventral groove, probably due to the contraction of the strong oblique muscles, exists in the middle line.

Marenzeller[1] describes a form (*Onuphis holobranchiata*) from the western shores of the Island of Ino Sima, Japan, in which a single large branchial process exists, but the anterior feet and the bristles are so characteristically different that no confusion is possible, though the dental apparatus is somewhat allied.

Notheria willemoesii,[2] n. sp. (Pl. XLI. figs. 4–10; Pl. XXVIA. figs. 1–4; Pl. XXXVA. fig. 1).

Habitat.—Dredged off Amboina, in 100 fathoms.

A fragment of the anterior region of the body, measuring about 38 mm. in length and 3·5 mm. in diameter, is alone available for examination.

[1] *Denkschr. d. math.-nat. k. Akad. d. wiss. Wien*, Bd. xli. p. 24 (sep. Abd.).

[2] Named in honour of Dr Rudolf v. Willemoes-Suhm, whose promising zoological career was cut short by his untimely death during the voyage.

The head (Pl. XLI. fig. 7) has the typical form. The median and lateral tentacles are of considerable length, and tinted of a pale buff colour.

The dental apparatus (Fig. 79) is madder-brown, with darker touches. In general outline it approaches that of the Eunicidæ rather than the series just considered, since the posterior appendages are nearly in the same plane as the maxillæ. The latter present a broad posterior half, without the evident basal constriction of the previous species. The anterior region is strongly curved, and gradually narrowed to the tip. The spathulate appendages form a symmetrical lobate region with a median notch posteriorly. The part near the maxillæ, corresponding to the base of the triangles, is constricted, then a somewhat ovate lamella expands on each side. The left great dental plate does

Fig. 79.

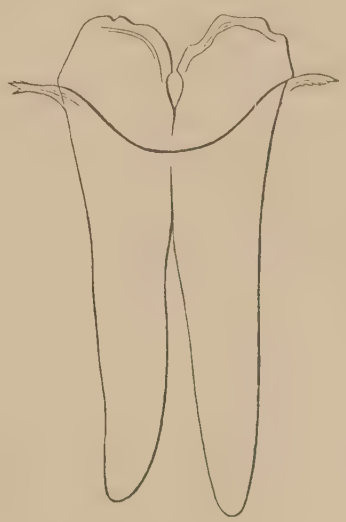


Fig. 80.

Fig. 79.—Maxillæ and dental plates of *Nothria willemoesii*, n. sp. The right and left lateral paired plates are in different positions ; × 24 diameters.

Fig. 80.—Ventral view of the mandibles of the same form ; × 24 diameters.

not present the long anterior fang so characteristic of the previous series, but ten teeth follow each other in an even row ; the right also has ten. The left lateral paired plate possesses eleven teeth ; the left unpaired nine. The right lateral plate shows about twelve. Two accessory plates occur on each side, the smaller inner one having a prominent tooth, while the outer forms a larger thin plate. The paired lateral plates have each a dark brownish band along the ventral alveolus. The mandibular shafts (Fig. 80) are short and broad. The outline of the ventral dental area is somewhat ovoid, the outer margin, however, being truncated. The halves approach each other closely.

The appearance of the post-cephalic region of the dorsum resembles that of an *Eunice*, from the great development of the branchiæ, but the ventral surface, especially anteriorly, is at once diagnostic. The first four feet embrace a region of their own, apparently corresponding to that formed by the first two in a new British form, and in many of the preceding species. These feet are much less prominent than the ordinary examples, and, indeed, each foot is ventral rather than lateral. The region is easily differentiated from the succeeding one by the presence of the ventral scutes. Instead, moreover, of the strong projecting bristles so characteristic of the common forms, each setigerous process, from the first to the fourth, bears a tuft of inconspicuous bristles which are directed downward (ventrally) rather than outward. The ventral cirri and setigerous processes of these (four) feet diminish in size from before backward, but the dorsal cirri do not alter much. The latter are thickish, knife-shaped processes of moderate length, and considerably stouter than in the ordinary form. The setigerous lobe bears posteriorly an elongated conical process, which also diminishes from before backward. The ventral cirrus is somewhat conical, and, as in *Nothria conchylega*, ceases with the region, indicating that the first scute, which occupies the same position, is homologous therewith. Each setigerous process bears two or three stout spines, on the convex margin of the tuft, followed by a series of rather short bifid bristles (Pl. XXVIA. fig. 1) with an evident curve. The forked tip is composed of short rounded processes, the distal being the longer. The entire extremity is guarded by a sheath or "wing," which is best seen from the dorsum (Pl. XXVIA. fig. 2). An articulation occurs some distance below the tip, as in *Nothria tenuisetis*. These four sets of bristles point ventrally in the specimen (which has been preserved *in situ*, that is to say, within its habitation), and are probably of service to it in its various movements near the mouth of its tube.

The succeeding region of the body commences at the fifth foot, and is characterised by the elongation of the dorsal cirrus, and the conversion of the ventral into a flattened glandular scute. The first scute is less than the others, but they rapidly increase in size, so that between the fourth and the tenth they attain their maximum, and again somewhat diminish posteriorly. They are most conspicuous in front of the fortieth foot, though they continue to the end of the fragment (beyond the seventieth foot).

At the tenth foot (Pl. XLI. fig. 8) the dorsal cirrus forms a long subulate process with a constriction at the base, which is supported internally by a tuft of simple bristles. Just above the enlargement at the base is a deposit of pigment, which becomes more distinct in the succeeding feet. The setigerous process has two groups of bristles, an upper longer and an inferior shorter series. Both conform to the same type, viz., bristles with stout shafts and tapering extremities, and furnished with boldly striated wings, the tips of the inferior, however, being much shorter than the superior. The branchial process appears at the seventeenth foot, springing from the constricted part at the base of the

dorsal cirrus, and being nearly as long as the latter at the twentieth foot. The two sets of bristles are by and by separated by a more decided interval, in which are several strong spines with curved blunt tips, some having a secondary distal process, thus foreshadowing the bifid hooks of the succeeding region. The delicate brush-shaped bristles (Pl. XXVIA. fig. 3) are also present, and as a rule the dilated region at the tip is oblique. The obliquity would not seem to result from position, since no other condition is observable. The upper fringes in all the specimens, moreover, are longer and more slender than the lower.

The thirtieth foot shows a branchial process of two divisions, and the dorsal cirrus is very attenuate. Both organs are supported by a common base, which apparently divides to form them. The setigerous lobe bears the winged dorsal bristles, and the brush-shaped forms, but the ventral are not visible, their places being supplied by the large hooked spines. At the fortieth foot the branchia has four lateral branches, and it is thicker at the base than the dorsal cirrus. The bifid winged hooks project beyond the setigerous process inferiorly; and the posterior lamella has now diminished to a papilla, which appears just below the dorsal bristles. The dorsal cirrus now appears as an appendage of the considerably larger branchia.

At the fiftieth foot (Pl. XLI. fig. 9) the dorsal cirrus can hardly be differentiated externally from the branchial organ, though the presence of the long delicate internal bristles, which seem to pass almost to the tip, is diagnostic of the cirrus, and the finely pinnate blood-channels of the branchia. The foregoing and the posterior feet have three stout spines with somewhat pointed tips, besides the bifid hooks, which are much shorter than the former.

Two long winged hooks (Pl. XXVIA. fig. 4) now project clearly beyond the setigerous process, and the posterior lamella is invisible. The hooks show a short dorsal and a longer (main) ventral process, and the wing or guard at the tip is truncate, as if from friction. The sixtieth and seventieth feet are similar to the foregoing, each branchia having five or six divisions, while the dorsal cirrus is attached like an appendage to the base. The presence of the long simple bristles in the latter may be of some service in preventing the too ready collapse of the branchiæ in the tube. The branchiæ are considerably longer than the cirri. The setigerous region of the foot is much less prominent, and the distinction between it and the scute beneath obscure.

The branchiæ throughout are the seat of a commensalistic *Loxosoma* (Pl. XLI. figs. 9, 10), and some of them show a distinct elevation at the point of attachment of the Polyzoon. A few specimens of the *Loxosoma* also occur on the dorsal cirri and feet, but the majority are situated on the respiratory organs proper.

The intestinal pellets are for the most part composed of tightly rolled whitish fibrous tissue, with here and there a few sand-grains, sponge-spicules, and other debris.

The tube (Pl. XLI. fig. 4) produced by this species is one of the most remarkable.

It is about 50 mm. in length, but being bent in the form of a shepherd's crook, its tunnel is much longer. The diameter is about 6 mm. It is firm and rounded, coated externally with greyish sandy mud, and internally by a tough whitish secretion. The ventral curve of the tube is comparatively smooth externally, but the rest of the surface, and especially the posterior curve, is furnished with a series of long, slightly bent elastic spines, in length three or four times the diameter of the tube, or about 25 mm. These stiff elastic spines (Pl. XLI. figs. 5, 6) are composed of layer upon layer of a hyaline secretion, probably the same forming the lining of the tube, a well-marked central cavity, moreover, giving the process a resemblance to a large sponge-spicule.

The central region, indeed, appears to be plaited or folded in some parts towards the tip, the distal region being veined like a piece of finely marked pitch-pine. It is filled with an opaque mass of granules towards the base, which is greatly enlarged at the point of attachment to the tube, and is there coated by the sandy mud of the general investment. When a spine is torn out a deep pit remains in the wall of the tube, for the bulbous base of the spine forms a hard solid mass. In their complete state the tips of the spines are acutely pointed.

An examination of the sections of the body-wall of *Nothria willemoesii* (Pl. XXXVa. fig. 1) shows that the comparative size and disposition of the great longitudinal muscles is a feature of some value, and not altogether dependent on the degree of distention of the perivisceral chamber. In proportion to its size the body is supplied with powerful muscles. The dorsal longitudinal are massive and characteristically reniform, the internal hilum being occupied by a large blood-vessel. The ventral are ovoid, and two or three fasciculi of vertical fibres branch from their upper margins obliquely downward and inward. The nerve-area is well marked, and the cords attain considerable size. Their investment lies on the circular coat, and the powerful vertical muscles from the middle line of the dorsal wall bound them at each side. A neural canal occurs rather below the middle of the united cords. The vertical fibres pass from the mid-dorsal region between the longitudinal muscles, support the wall of the intestine on each side, and are attached ventrally as before mentioned. The conspicuous strength of these bands must exercise an important influence on the canal. Fibres of attachment, moreover, occur between their inner surface and the digestive tract. Other vertical fibres proceed from the dorsal wall outside each longitudinal muscle, and are directed slightly inward inferiorly, so as to send fasciculi into the ventral longitudinal. The circular muscular layer is equally developed dorsally and ventrally, and the narrow hypoderm is densely granular dorsally, and thickened in the median line ventrally. A cavity dorsally at the base of each foot contains the large glandular mass, probably connected with the special function of tube-secretion.

A fragment of the tube of this species occurs in the British Museum, from the collection made by H.M.S. "Alert,"[1] lat. 34° 11′ N., long. 136° 33′ E.; depth, 71 fathoms.

[1] I may here bear testimony to the extent and value of the Annelida collected by the "Alert."

Moreover, a large empty curved tube (of unknown relations) from the same series is protected by the spines of Echinoderms in a similar manner to the foregoing. It came from Port Darwin, at a depth of 7 to 12 fathoms.

Nothria ehlersi,[1] n. sp. (Pl. XLII. figs. 1–3 ; Pl. XXVIA. figs. 5–7 ; Pl. XXXVA. fig. 2).

Habitat.—Dredged at Station 298 (off the South American coast, a little south of Valparaiso), November 17, 1875 ; lat. 34° 7′ S., long. 73° 56′ W. ; depth, 2225 fathoms ; bottom temperature 35°·6, surface temperature 59°·0 ; sea-bottom, blue mud. Also at Station 299, December 14, 1875 ; lat. 33° 31′ S., long. 74° 43′ W.; depth, 2160 fathoms ; bottom temperature, 35°·2 ; surface temperature, 62°·0 ; sea bottom, blue mud.

A form of great length, but from the fact that the specimens have been preserved *in situ* in their tough elongated tubes without the frequent changes of spirit necessary

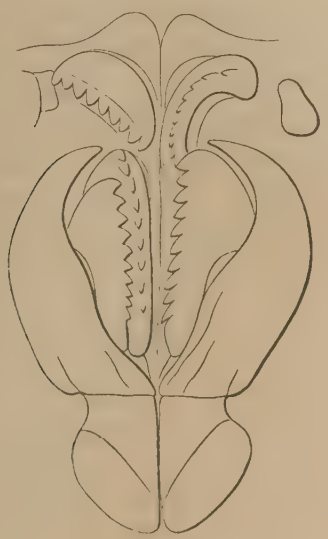


Fig. 81.

Fig. 82.

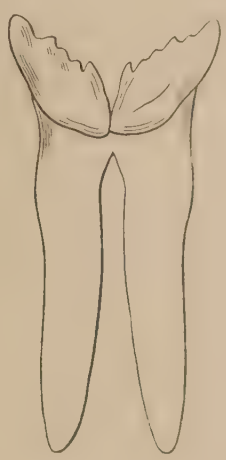


Fig. 83.

Fig. 81.—Maxillæ and dental plates of *Nothria ehlersi*, n. sp.; × 24 diameters.
Fig. 82.—Spathulate posterior region of another specimen, showing the variability of the thinner marginal region ; × 24 diameters.
Fig. 83.—Mandibles of the same species, from the ventral aspect ; × 24 diameters.

in such a case, they are imperfectly represented posteriorly. One example measures 170 mm. in length, with a diameter of 2·5 mm. anteriorly, and this is probably the average size.

The head is characterised by having a shorter median than lateral tentacles, whereas in the former species the reverse is the case. In the present form the short median

[1] Named in honour of Prof. Ehlers of Göttingen.

tentacle is flanked by two long lateral tentacles. The two inferior (or external) lateral tentacles are stouter and generally slightly longer than the median, though in one specimen the organ of one side is the longest process of the kind on the head. There would, indeed, appear to be considerable variety in regard to the cephalic processes. One specimen shows short tentacles throughout, with the exception of the long inferior lateral just mentioned. Another presents a bifid median tentacle, the ringed base splitting into a larger and a smaller division at the summit; three rings, moreover, being apparent at the commencement of the former, and one on the latter. It would seem that when injury occurs to several of the tentacles, those remaining (especially the inferior or external lateral) are especially elongated and enlarged. Two short and bluntly conical frontal tentacles occur anteriorly. The lateral palpi are prominent and rounded.

The buccal segment has dorsally two rather short tentacular cirri, the tips of which reach, in those best developed, the bases of the cephalic tentacles. Moreover, in one example, the left side has two instead of one, both, however, being smaller than the right cirrus. The pair arise close together, apparently from a common base.

The dental apparatus (Fig. 81) is dull brownish, with a dark band in front of and between the posterior appendages. The maxillæ are almost in the same plane with the latter, and are characterised by their shortness, the great breadth of the posterior region, and the strength of the short and strongly curved fangs anteriorly. The posterior appendages are constricted at the base (next the maxillæ), and have a more or less dilated margin, which is sometimes notched. The variability of the thinner marginal region (Fig. 82) seems to be a common feature, the firmer basal median part being triangular. The left great dental plate agrees with the preceding in the absence of the long anterior fang, and has nine or ten teeth; the right possesses ten. The left lateral paired plate shows six and the unpaired ten; the right has nine teeth. A single and somewhat quadrate accessory plate occurs on each side, the inner edge rising as usual into a tooth. The mandibles (Fig. 83) show an irregularly denticulated anterior or cutting edge, the distal portion being separated from the basal by a transverse line and a prominent external margin. The latter condition, so often seen, may be connected with the reproduction of the tip. The mandibles are ankylosed at the dental junction, and a slightly marked pigment-line occurs along the margin of the crescent. Two blackish stripes occur inferiorly, one on each side of the dental symphysis.

The first region of the body consists of three segments, each having a thickish dorsal cirrus, constricted at the base, and a ventral cirrus, only a little shorter and of similar form. The setigerous lobe has a short, conical, posterior process. These feet bear superiorly a few simple, tapering bristles, and inferiorly a jointed bifid series (Pl. XXVIA. fig. 5) with guards at the tips. The distal process is large and blunt, the inferior shorter and more acute. The articulation occupies the usual position, but is less differentiated, perhaps, than in the previous species.

The fourth foot is characterised by the conversion of the ventral cirrus into a scute or flattened disk, and the latter occurs on the other segments, apparently to the posterior end, though the scutes are less glandular and opaque posteriorly. At the tenth foot the dorsal cirrus is short and almost lanceolate from the great expansion at the base, a feature very diagnostic when contrasted with *Nothria willemoesii*. There is only a trace of the posterior lamella of the setigerous region. The upper bristles of the latter lobe are long and finely tapered at the tip.

The branchiæ commence on the seventeenth foot, either as a simple process, or as one with a bifid tip. At the twentieth foot the branchia is still bifid, and from the first is much longer than the dorsal cirrus which is attached to its base, so that the cirrus resembles a process of the main branchial stem, especially as a large blood-vessel enters its substance. The dorsal bristles proceed only a short distance into the cirrus. The main branchial pillar at the thirtieth foot splits into three long terminal divisions and a shorter process, and thus diverges quite from the lateral branching of the organ in *Nothria willemoesii*. The upper bristles of the setigerous process are very long and much tapered, with a slight curve at the tip. At the fortieth foot there are still three branchial divisions and a small fourth, but all are shorter. At the fiftieth foot the branchial process is simple, and, moreover, it is shorter than the dorsal cirrus. The comparatively greater length of the bristles than those in *Nothria willemoesii* is evident. The branchia is much less at the sixtieth foot, and disappears altogether before the seventieth is reached. From the tenth foot backward the dorsal cirrus diminishes in bulk but increases in length. In regard to the structure of the bristles in the upper series of the setigerous lobe, it is apparent that they are larger and more finely tapered than in the previous species, and much more so than in *Nothria conchylega*. The tips have a narrow wing on each side. A curved tapering appendix occurs on the extremities of one or two of the spines in the twentieth foot.

The long posterior hooks (Pl. XXVIA. fig. 6) have a smaller and more erect distal process than in *Nothria willemoesii*, and the large prong is more acute. These hooks become much more slender toward the posterior end of the animal, but they retain for the most part their proportions, except that the distance between the bifid tip and the striated region is greater, showing that considerable elongation has occurred.

The brush-shaped bristles (Pl. XXVIA. fig. 7) have rather narrow elongated tips and fimbriæ. They differ, therefore, from those of the previous species, just as the long simple bristles do.

The tubes are of great length, viz., upwards of 500 mm., with a diameter of 5 or 6 mm. They are for the most part rounded and firm, composed externally of dark greyish mud, only slightly coherent, and internally of a tough whitish secretion with a glistening surface. One end is somewhat bulbous and almost closed. So far as the specimens show there is no special structure at the open end. On the whole such tubes are much more

fragile than those of the Sabellidæ, though they closely approach them in external appearance.

The body-wall in this form (Pl. XXXVa. fig. 2) affords a contrast with that in *Nothria willemoesii*, since the great muscles do not cover so large an area. The ventral longitudinal muscles are considerably larger than the dorsal, and form elongate masses with the inner edge somewhat more pointed than the outer, and separated by a wide median interval. The dorsal longitudinal muscles are lobate externally and pointed internally, and they are also separated by a wide median interval. The vertical fibres arising in the latter decussate in the middle line, and then pass downward by the side of the alimentary canal to the ventral hypoderm. These fibres are not so conspicuous as in *Nothria willemoesii*, and they apparently run into the circular coat inferiorly. At intervals also a pair of divergent muscular bands leave the median line of the alimentary canal and arch over the nerve-area, running into the circular coat with the former. These fibres are apparently diminished in length in the intervals between the ganglia, and elongated over the latter. Indications of a neural canal occur inferiorly. The alimentary tract in section presents a richly glandular aspect internally, and it seems less prone to form the rigid frills usually observed. The cuticle is thickest on the ventral surface over the region embraced by the ventral muscles and nerve-area. It becomes thinner at the outer border of the muscles, and again somewhat increases in thickness over the dorsal arch. The hypoderm is comparatively thin, except over the glandular region between the bristles and the outer edge of the ventral longitudinal muscles, where it forms a dense layer. The great glandular mass in this region seems to be connected with the secretion of the tubes. It is separated from the thick investment of hypoderm by the circular muscular coat, which is of moderate bulk. The outer vertical muscles, which in the former species pierce the longitudinal ventral, are less developed.

Nothria armandi,[1] n. sp. (Pl. XLI. figs. 11–13; Pl. XXVIa. figs. 8–10).

Habitat.—Trawled at Station 157 (about midway between Kerguelen and Melbourne), March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; bottom temperature 32°·1, surface temperature 37°·2; sea-bottom, Diatom ooze.

A fragment of the anterior region, about 70 mm. in length and barely 2 mm. in breadth.

The head, like the rest of its congeners from the deep sea, is devoid of eyes. The median tentacle is absent. The two lateral have a similar proportional length to those of *Nothria ehlersi*. The two inferior tentacles, again, are somewhat shorter and thicker than in the latter form. The antennæ (frontal tentacles) are also somewhat shorter and less conical. The tentacular cirri offer no peculiarity.

[1] Named in honour of M. Armand de Quatrefages.

The dental apparatus (Fig. 84) is peculiar in the great proportional length of the posterior appendages, the region occupied by the latter being only a little shorter than the maxillæ. In this respect, therefore, the apparatus diverges from that in *Nothria ehlersi*. The colour is also pale, a blackish pigment-line occurring between the maxillæ and the appendages, and a dark band forming a border to the latter on each side posteriorly. The various parts are also comparatively soft, and therefore less brittle; but this feature is perhaps of slight moment until the correct physiology of the parts is made out. The proportions of the maxillæ are similar to those of *Nothria ehlersi*. The anterior fang is finely pointed (from freshness?) and much curved. The posterior appendages have a well-marked cylindrical region next the maxillæ, and an expanded and smoothly rounded, lamellar region, with a deep median notch distally (posteriorly). The left great dental plate has ten teeth, counting the inferior prominence, the right ten. The left lateral paired plate shows six or seven, the unpaired nine. The right lateral presents about seven. The mandibles are as soft as the other parts of the apparatus, the incisive edge being bulbous, and the semicircle on the ventral surface forming a soft apron from one side to the other. The transverse line running outward into the projecting edge at each side is as distinct as in the densest specimen; and the two dorsal pigment-bands on each side of the symphysis are boldly defined.

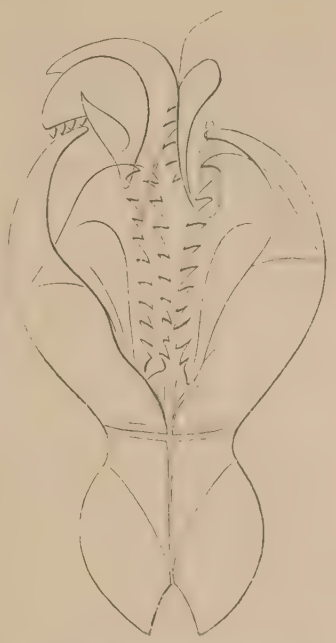


Fig. 84.—Maxillæ and dental plates of *Nothria armandi*, n. sp., from the dorsal aspect; × 24 diameters.

The first region of the body, like that in *Nothria ehlersi*, consists of three segments. These closely approach the latter in form, though certain minor differences are apparent. The jointed bristles have the distal process less acute and more bulbous than in the former species, and the secondary or inferior process is smaller (Pl. XXVIa. fig. 8). It is remarkable to notice how closely these forms approach each other, and yet how pervading the distinctions are.

After the fourth foot the ventral cirrus forms a scute. In comparing the anterior feet of this and the former species (*Nothria ehlersi*) it is found that the dorsal cirrus in this is much less dilated at the base, and therefore less broadly lanceolate, while its inner or dorsal margin is somewhat crenate.

A branchia appears on the sixteenth foot (on one side) as a bifid process of considerable length. At the twentieth foot the bifid branchiæ are about twice the length of the dorsal cirrus, which, as in the former species, is appended to the common base. The branchiæ are decidedly longer than in *Nothria ehlersi*, in which they are only about a third longer than the dorsal cirri. At the thirtieth foot the branchia has only two

divisions, the inner being shorter than that between it and the cirrus. It thus quite differs from *Nothria ehlersi*, which has three branchial divisions in this foot. Moreover, both dorsal cirri and branchiæ are more slender than in the species just mentioned. A single branchial process exists on the fortieth foot, and it is about the same length as the dorsal cirrus, whereas in *Nothria ehlersi* the branchia has three divisions on the same foot. A small branchial lobule occurs at the base of the dorsal cirrus of the fiftieth foot, but it disappears before the sixtieth foot is reached. In this species, therefore, the branchiæ are somewhat more feebly developed than in its congener, to which, however, it is closely allied.

There is no very evident distinction between the dorsal bristles of the two species. Both are elongate, with finely tapered tips and narrow wings. The brush-shaped bristles (Pl. XXVIA. fig. 9) also closely resemble those of the preceding species.

The long hooks (Pl. XXVIA. fig. 10) agree with those of *Nothria ehlersi* in most details, though they are shorter and broader. There is less space between the tip and the commencement of the shaded region, and the distal prong is less acute.

The tube formed by this species is of a light greyish colour, and almost entirely composed of Diatoms and Radiolarians. It is friable, and contrasts strongly with a large tube of a *Sabella* from the same Station, for the latter is remarkably tough, probably from the great development of the inner lining of chitinous secretion, though the external greyish coating is of the same microscopic structure.

In section the cuticle is of considerable thickness, both dorsally and ventrally. Over the thick hypoderm of the lateral regions, however, it is thinner. With the exception of the lateral increase just noted the hypoderm is feebly developed. The circular muscular coat is also somewhat thin. Both dorsal and ventral longitudinal muscles are large, as also are the vertical muscles by the side of the alimentary canal. Some oblique muscles proceed from the outer borders of the dorsal longitudinal, and with the inferior oblique join the circular coat at the ventral surface. The arch from the alimentary canal encloses the nerve-area, which is bounded externally by the circular coat. The glandular region is close to the outer border of the dorsal longitudinal muscle, and thus in many sections it appears above the bases of the spines and bristles. The thickened hypoderm over this region is thus much higher than in *Nothria ehlersi*, the glandular tissue of which generally presents itself below the bristles.

Nothria quadricuspis (M. Sars).

Onuphis quadricuspis, M. Sars; G. O. Sars, Bidrag Kundsk. Christianiafjordens Fauna, Bd. iii. p. 16, Tab. xv. figs. 7–19.

Habitat.—Dredged by the "Knight Errant," Station 6, August 11, 1880; lat. 59° 37′ N., long. 7° 19′ W.; 530 fathoms; bottom temperature 46°·5, surface temperature 57°·0; sea-bottom, grey mud.

A minute form about 1 mm. in diameter, in which the median is considerably shorter than the adjoining tentacles. The other processes (including the tentacular cirri) are absent. No eyes are present.

The maxillæ (Fig. 85) are much curved, and there is a marked constriction of the posterior processes immediately behind the point of junction. The processes are pointed posteriorly and the tip of each is dark brown, while a bar of brown pigment also exists behind the maxillæ. The left great dental plate has six teeth, the right eight. The left lateral paired plate has six, the unpaired six. The right lateral shows seven. The mandibles (Fig. 86) have curved shafts, and the cutting edge presents a denticulation or

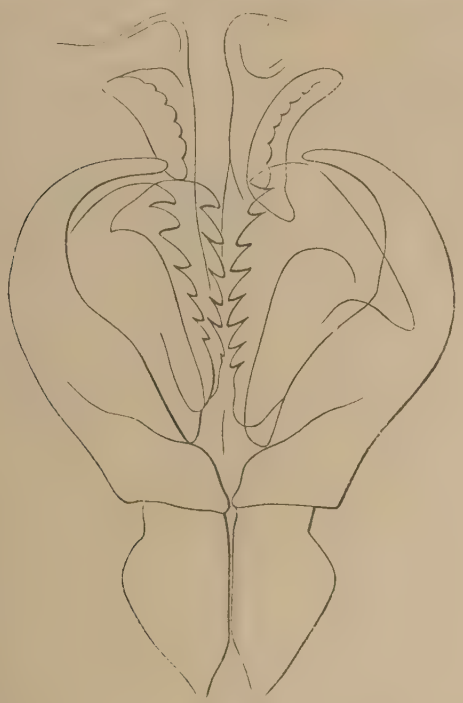


Fig. 85.

Fig. 86.

Fig. 85.—Maxillæ and dental plates of *Nothria quadricuspis* (M. Sars); × 55 diameters.
Fig. 86.—Mandibles of the same species from the ventral surface; × 55 diameters.

two, somewhat symmetrically arranged. The entire apparatus is somewhat soft. The dental apparatus was not examined minutely by Sars.

The body has the usual structure, and the branchiæ commence as simple processes on the ninth foot, in which, as in other respects, it agrees with a specimen dredged by the Rev. Dr. A. Merle Norman off Bergen, Norway, and with the descriptions and figures of M. Sars, as given from his unpublished manuscripts by G. O. Sars. The specimen is evidently a young form, and only about twenty-five segments are present. The branchiæ therefore have not attained full development. The highest number of divisions is four, whereas five are present in the Norwegian example.

The tube of this form is composed of a delicate hyaline secretion coated with greyish muddy sand, and it is rather friable. Sars found his specimens at a depth of 120 fathoms, but the present example goes considerably deeper.

Nothria minuta, n. sp. (Pl. XL. fig. 4; Pl. XXIA. figs. 17, 18).

Habitat.—Trawled at Station 169 (off East Cape, North Island, New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; sea-bottom, blue mud.

A minute species measuring about 20 mm. in length and a little more than half a millimetre in breadth.

The median tentacle is comparatively short, only a little longer than the external lateral. The pair next the median are of considerable length. The palpi are thick and blunt, almost globular. No eyes are present.

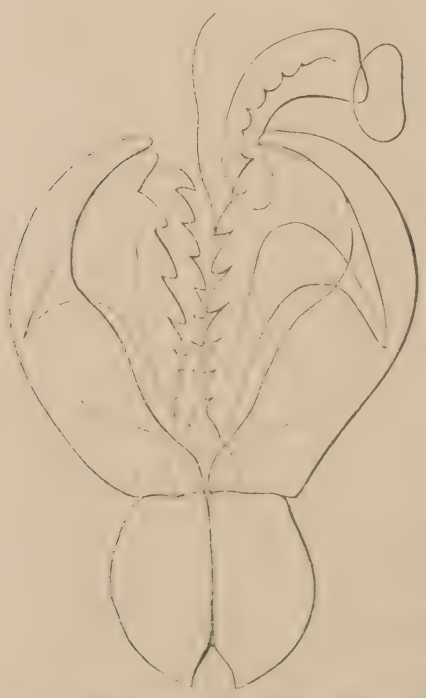


Fig. 87.—Maxillæ and dental plates of *Nothria* [illegible], n. sp.; × 90 diameters.

The dental apparatus (Fig. 87) is comparatively pale. The maxillæ are broad posteriorly, strongly curved anteriorly. The left great dental plate differs from the ordinary structure in *Hyalinœcia*, in possessing very large anterior teeth. It is true the first does not reach the proportions in such as *Nothria pycnobranchiata* and allies, but it sufficiently diverges from any ordinary *Hyalinœcia*. There are only six teeth in this plate, the first three being very large, the second and third occupying about a third of the total length of the plate. The right great dental plate shows eight teeth, but the size of the anterior teeth is not disproportionate, as on the other side. The left lateral paired plate is crushed, the unpaired has about eight teeth. The right lateral plate presents six or seven teeth. Unfortunately the mandibles also are crushed, and all that can be said is that a dark pigment-stripe occurs on each side of the symphysis.

The dorsal cirri anteriorly are comparatively short and thick. No branchiæ are visible.

The first foot quite differs in development from *Hyalinœcia tubicola*, and bears a series of much curved bristles (Pl. XXIA. fig. 17) which have no articulations.

Generally the anterior feet are characterised by the presence of two long hooks, which at the tenth have attained considerable development, though the tip is smaller than in the posterior forms. The upper hook in each foot has, indeed, a less developed crown than the inferior (Pl. XXIA. fig. 18). They approach in most respects those of Kinberg's *Onuphis setosa*. The winged bristles of the Challenger form, however, are short and comparatively feeble. The brush-shaped bristles generally show an oblique tip, probably due in some cases to position. The species differs from Kinberg's form (*Onuphis setosa*) in the absence of branchiæ.

No styles are attached to the tail, having probably been lost, and there is no tube in connection with it.

In sections of the body-wall the structure is nearly typical. The cuticle is comparatively thick, except over the great hypodermic lateral pads in the glandular region. The nerve-cords are outlined in the area, and the ganglia are large. A minute neural canal appears in the usual position inferiorly.

The general aspect of the tentacles and anterior region, the structure of the dental apparatus and other points, show a closer resemblance to *Nothria* than to *Hyalinœcia*.

Hyalinœcia, Malmgren.

Hyalinœcia tubicola, O. F. Müller.

Habitat.—Small specimens were dredged at Station 75 (off Fayal, Azores), July 2, 1873; lat. 38° 38′ N., long. 28° 28′ 30″ W.; depth, 50 to 90 fathoms; surface temperature, 70°; sea-bottom, volcanic mud.

Another small specimen, trawled at Station 235 (a little south of Japan), June 4, 1875; lat. 34° 7′ N., long. 138° 0′ E.; depth, 565 fathoms; bottom temperature 38°·1, surface temperature 73°·0; sea-bottom, green mud.

This form has a very wide range.

In the examples from the first locality the branchiæ commence on the twenty-second foot, and eyes are present. The dental armature is typical. Thus the left great dental plate has thirteen, the right twelve teeth; the left lateral paired plate seven or eight, left unpaired fourteen, and right lateral eight or nine teeth. The mandibles as usual have the outer dental edge directed forward. The muscular band passing transversely between the feet and touching the summit of the nerve-cord is well marked.

The example from the second locality has been dried, but so far as can be made out it corresponds with the typical form. The left great dental plate has thirteen teeth, the right the same number; left paired plate ten, left unpaired twelve, right lateral twelve.

The posterior processes of the maxillæ are short and broad, the two almost forming a semicircle. The anatomy of the body-wall agrees with that in the ordinary form.

Hyalinœcia tubicola, O. F. Müller, var. (Pl. XL. fig. 1).

Habitat.—Trawled in great numbers at Station 320 (off the coast of Buenos Ayres, South America, to the south of the estuary of the Rio de la Plata), February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom temperature 37°·2, surface temperature 67°·5; sea-bottom, green sand. It is stated on the label that the specimens came from hard ground, but this is unusual.

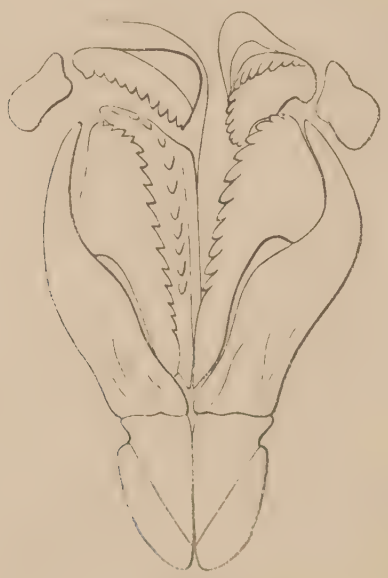


Fig. 88.

Fig. 89.

FIG. 88.—Maxillæ and dental plates of *Hyalinœcia tubicola*, O. F. Müller, var.; × 15 diameters.
FIG. 89.—Mandibles of the same; × 15 diameters.

This large Annelid inhabits a tube about the size of a goose-quill, but much resembles the ordinary form in appearance, both in regard to animal and tube. The latter measures from 200 to 220 mm. in length, with a diameter at the wide end of 8 mm., and at the narrow extremity of 4 mm.

The head agrees with that of the typical form except in size and in the variable proportions of the organs. The eyes are absent. The dental armature (Figs. 88, 89) differs from the description of Ehlers in having fourteen teeth on the right great dental plate and seventeen on the left, being one more on each side, but the difference in size is striking. Moreover, the number of teeth is variable, and occasionally it corresponds with that in the typical examples.

The branchiæ in the British examples of *Hyalinœcia tubicola* commence on the twenty-fourth or twenty-fifth foot, while in this variety they begin on the twenty-fifth or twenty-sixth, occasionally on the twenty-seventh. The organs are proportionally larger, but of similar structure.

The bristles of the first foot are simple and smooth. The wide end of the tube has thin walls. At the narrow end are several diaphragms which are fixed to the sides.

In the anterior region the general aspect in transverse section corresponds with that in *Hyalinœcia tubicola*, though there are certain minor distinctions which, however, may be due to the greater size and development of all the parts. Thus the nerve-area, instead of resting for the most part freely on the commissure of the oblique muscles, is enveloped by a dense series of fibres, chiefly vertical and superior oblique, but also of fibres from the inferior border of the alimentary canal, which enclose a large blood-vessel. As in most large forms the nerve-area is proportionally smaller and more flattened than in the British species (the size of which is much less), but the neural canal occupies a similar position. The circular muscular coat, the hypoderm, and the cuticle have about the same bulk. A large blood-vessel occupies the intermuscular area dorsally, where two are conspicuous in the common form, and the great vascularity of the muscular and other tissues within the hypoderm is evident. Posteriorly the chief changes consist in the flattening of both dorsal and ventral muscles in accordance with the shape of the body, and the appearance of the reproductive elements at the bases of the feet. The nerve-area is much widened, but the cords are flattened.

Hyalinœcia tubicola, O. F. Müller, var. *longibranchiata*.

Habitat.—This variety was trawled at Station 167 (near Cape Farewell, southern island of New Zealand), June 24, 1874; lat. 39° 32′ S., long. 171° 48′ E.; depth, 150 fathoms; surface temperature, 58°·5; sea-bottom, blue mud.

It presents well-marked eyes, which have a whitish opacity in the centre. The branchiæ are proportionally longer than in the normal form, a feature which may have some relation to its surroundings. They commence on the twenty-sixth foot.

The left great dental plate shows from fifteen to eighteen teeth, the right from eleven to fourteen; seven denticulations are visible in the left lateral paired plate, besides some indistinct crenations posteriorly. The unpaired plate has fifteen teeth. The right lateral paired plate presents nine evident and some indistinct teeth. The mandibles have broad shafts and pointed dental processes directed obliquely outward. They are not ankylosed. The right mandible is as usual somewhat broader than the left.

The tubes are proportionally less tapered, rougher in their structure, and in addition have numerous adventitious growths, *e.g.*, Mollusca, Molluscoida, and *Serpulæ*.

This variety for the most part corresponds in transverse section with the typical form, the two dorsal blood-vessels, the nerve-area, and other parts being well marked, the latter (nerve-area) is, however, less free than in *Hyalinœcia tubicola*, for the upper oblique and vertical fibres shut in the region at intervals. The great glandular organ at the outer border of the ventral longitudinal muscles is largely developed.

Grube [1] describes a form (*Hyalinœcia platybranchis*) from the Cape Verde Islands, in which the flattened branchiæ commence on the eighteenth segment. It seems to be closely allied to the foregoing.

Fig. 90.—Left maxilla of *Hyalinœcia tubicola*, O. F. M., var. *longibranchiata*; enlarged.

A still more marked variety was dredged on the 12th February 1873, off Gomera, Canary Islands, in 600 fathoms.

In this the long branchiæ commence on the twentieth foot (instead of the twenty-fourth in the typical form), and both they and the dorsal cirri are much longer than those of the previous examples.

The maxillæ (Fig. 90) are powerful and slightly hooked. The left great dental plate shows fourteen teeth, the right twelve; the left lateral paired plate had several broken teeth, but apparently from six to nine; unpaired left twelve; right lateral ten distinct and several crenations. A quadrangular accessory plate with a conical internal tooth. The mandibles are pointed externally, and are separate.

No eyes are present. The tips of the posterior hooks have thicker and stronger forks than in the typical form.

The vertical and oblique muscles in the example from Gomera are less conspicuous, otherwise the structure is typical, though the branches of the blood-vessels are numerous.

The *Hyalinœcia camiguina* of Grube,[2] from the Philippines, is another form which approaches the typical one closely, differing chiefly in the origin of the branchiæ and the serrations of the dental plates.

[1] *Monatsber. d. k. preuss. Akad. d. Wiss. Berlin*, 1877, p. 527; and *Jahrb. schles. Gesellsch.*, June 1877, p. 12 (sep. Abd.).

[2] Annelidenfauna d. Philippinen, p. 142, Taf. x. fig. 1.

Hyalinœcia tubicola, O. F. Müller, var. *papuensis*.

Habitat.—This variety was dredged at Station 186 (Torres Strait), September 8, 1874; lat. 10° 30′ S., long. 142° 18′ E.; depth, 8 fathoms; sea-bottom, coral mud.

The dorsal cirri as well as the branchiæ are short. The latter commence on the twenty-fifth foot. The proportions of the feet also differ. Thus the dorsal cirrus of the tenth foot has a larger base, and is shorter than in the typical form, and the boss or knob of the setigerous region is round. The bristles are similar, but the posterior hooks in var. *papuensis* have shorter and thicker forks.

The left great dental plate (Fig. 91) has eleven teeth, the right nine; left lateral paired plate six and a few crenations; unpaired ten. The right lateral has about nine and a few crenations at the inner end. The mandibles are not ankylosed.

In minute anatomy this agrees with the typical examples, the great transverse muscle passing from side to side over the nerve-area being conspicuous.

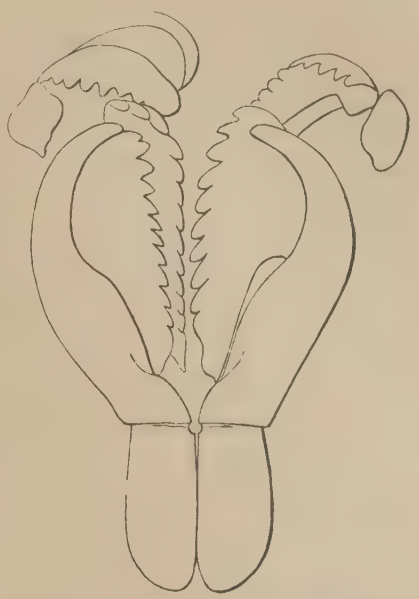


Fig. 91.—Maxillæ and dental plates of *Hyalinœcia tubicola*, O. F. M., var. *papuensis*; × 24 diameters.

This approaches the *Hyalinœcia brevicirris* of Grube[1] from Eastern Australia, though no eyes are present, and the serrations of the dental plates slightly diverge.

Hyalinœcia benthaliana, n. sp. (Pl. XL. fig. 3; Pl. XXIa. figs. 15, 16).

Habitat.—A small specimen (dried) was trawled at Station 158 (a point considerably south of Australia), March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms; bottom temperature 33°·5, surface temperature 45°·0; sea-bottom, Globigerina ooze.

Unfortunately its condition is such that little can be said about it further than that its posterior hooks differ materially from those of *Hyalinœcia tubicola* in having the upper fang much less produced, and the angle between the two acute and narrow. A specimen from one of the posterior feet is figured in Pl. XXIa. fig. 15. It approaches Kinberg's *Onuphis intermedia* in regard to the shape of this process. No evidence of branched branchiæ, however, is noticeable. These organs are simple. The greyish-white intestinal pellets are chiefly composed of Diatoms.

[1] *Monatsber. d. k. preuss. Akad. d. Wiss. Berlin*, 1877, p. 527.

What appears to be the same form (Pl. XL. fig. 3) was trawled at Station 168 (a little west of the northern island of New Zealand), July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature 37°·2, surface temperature 57°·2; sea-bottom, blue mud. It is a small species.

The head has a slender median tentacle which is almost a third longer than the adjoining pair, the latter being likewise slender and tapered. The external pair, on the other hand, are comparatively thick, short, and blunt, being only about a quarter the length of the adjoining pair. The palpi in front are rounded and almost united, the species differing in this respect from its allies; indeed from the dorsal aspect a slight notch alone indicates their separation, while on the ventral surface this region presents even a more striking divergence from such a form as *Hyalinœcia tubicola*, in its great antero-posterior length, its differentiation only by a median groove, the indistinctness of the palpi, and the absence of median antennæ in front.

The minute size of the dental apparatus and the state of the specimen are inimical to accurate description. The type seems to conform to that of *Hyalinœcia tubicola*. A feature of interest is the occurrence of a conspicuous blackish band in the mandible on each side of the symphysis and extending far backward. The same is seen in the specimen from Station 158.

In the sections of the body-wall no transverse muscle is seen, but the small size of the specimen renders such features less reliable. So far as could be observed, the muscles are similar, but they are less bulky.

No branchiæ are seen.

The first foot bears a series of long bristles (which, however, do not project much beyond the soft tissues) with a bifid tip and wing. One from the margin of the dried example is shown in Pl. XXIA. fig. 16. In the smaller fresh specimens the bristles seem somewhat larger and more slender, but with the same outline.

The feet had the usual structure, and the pair of long slender hooks quite agree with that figured above (from the twentieth foot).

The tail is terminated by two slender styles.

The body of the animal is comparatively short, but the posterior end appears to have been recently reproduced.

The tube is a semitransparent chitinous one of the ordinary shape.

The intestinal canal had a fragment of the jaw of one of the Eunicidæ apparently like *Aracoda* or *Drilonereis*.

Hyalinœcia bilineata, Baird.

Hyalinœcia bilineata, Baird, Journ. Linn. Soc. Lond., vol. x. p. 358.

Habitat.—Dredged in the "Knight Errant," Station 3, August 3 and 4, 1880; lat. 59° 12′ N., long. 5° 57′ W.; depth, 53 fathoms (off the Island of North Rona).

Family Goniadidæ.

Only one or two representatives of this family have, as a rule, occurred in the collections made during the various voyages. The only one procured in the Challenger inhabited 10 fathoms' water. None are mentioned by Schmarda. Kinberg in his anelids of the "Eugenie" describes five, under four genera, while Grube mentions but one in the series from the "Gazelle," and another in the Philippine collection.[1] Ehlers found *Eone nordmanni* at a depth of 725 fathoms from the "Porcupine," and *Goniada maculata* a little deeper.

They range to the extreme north and far southward, as well as to the intermediate warmer area.

Eone, Malmgren.

Eone trifida, n. sp. (Pl. XLII. fig. 4; Pl. XXIIa. figs. 8, 9).

Habitat.—Dredged at Station 167a, Queen Charlotte Sound, Cook Strait, June 27, 1874; lat. 41° 4′ S., long. 174° 19′ E.; depth, 10 fathoms; surface temperature, 51°·5; sea-bottom, mud.

A small and incomplete specimen, about 12 mm. in length and less than 1 mm. in breadth.

The body agrees in appearance with that of the ordinary form, the only noteworthy difference being in the shape of the feet, which, especially behind the middle, are on the whole shorter.

The teeth somewhat resemble those of *Eone nordmanni*, the maxillæ presenting a basal region with a central aperture and three or four prominent denticulations. The smaller paragnathi have about four teeth on the free edge.

At the tenth foot the three processes are much shorter than in *Eone nordmanni*, and the median or setigerous lobe is more evidently and symmetrically bifid. The bristles, however, do not present any noteworthy difference. The three lobes of the foot in the European form are long and nearly equal, but in the Challenger species the setigerous lobe is much more bulky than either of the others (Pl. XLII. fig. 4), and bifid. Moreover, the shafts and tips of the bristles are decidedly longer (Pl. XXIIa. fig. 8).

At the fiftieth foot the differences are even more pronounced. Instead of the two long lobes in each division of the foot in *Eone nordmanni*, the new form shows dorsally a short lobe with a smaller process beneath. The setigerous lobe is blunt, the inferior

[1] Annelidenfauna d. Philippinen, p. 185.

angle alone slightly projecting. The bristles of this division (Pl. XXIIA. fig. 9) resemble those of the European species. The superior or setigerous lobe of the inferior division differs from the latter in having three well-marked papillæ at the tip, and, as also in front, the tips of the bristles are perhaps more slender.

In transverse section this species agrees for the most part with the type observed in *Eone nordmanni*, though certain characteristic differences are present. Thus there is a marked median raphe dorsally, covered only by hypoderm and cuticle, while a very thick layer of circular fibres spreads out on each side, as far as the bases of the feet. Moreover, the dorsal longitudinal muscles have no fold externally as in the British species. The nerve-area, however, is similar in position and relations, though it is proportionally larger and less tapered superiorly.

There is no special objection to the view of Ehlers[1] that the genus *Eone*, Malmgren, should be merged in that of *Goniada*, Aud. and Ed., but it should be remembered that the structure of the dorsal division of the foot, both in soft parts and bristles, shows a decided difference, and the same may be said of the teeth. Further, Ehlers does not mention that between the body-walls of the common forms, *Goniada maculata* and *Eone nordmanni*, there is this divergence, viz., that in the latter the dorsal longitudinal muscles have a well-marked fold inferiorly, while in the former such is not the case. Too much weight, however, need not be put on this feature, and the present example is devoid of this fold. Wirén[2] follows Ehlers in including *Eone* under *Goniada*.

Family Glyceridæ.

All the Glyceridæ in the Challenger collection occur at moderate depths, none going beyond 470 fathoms. In the "Porcupine" Ehlers found several species at considerable depths, for instance the ubiquitous *Glycera capitata*, Œrsted, at the 630 fathoms' line. The number of species is six, four of which are new, and this compares fairly with the results of other voyages. Thus Grube in his Annulata Œrstediana gives three new species, two in the collection made by the "Gazelle," and three in Semper's Philippine series. Kinberg again has three new species in the voyage of the "Eugenie"; while Schmarda describes no less than eight, but the majority of these were found between tide-marks.

The discrimination of the Glyceridæ in spirit is less easily accomplished than in most forms, considerable care being necessary.

As a rule the intestinal canal is empty, a condition either arising from the great muscularity of the animal, and its spasmodic contractions on immersion in spirit, or from the brief sojourn of the food (sandy mud) in the tract.

[1] Die Borstenwürmer, ii. p. 703. [2] Vega Exped., Bd. ii. p. 403.

Glycera, Savigny.

Glycera tesselata, Grube (Pl. XLII. fig. 5).

Habitat.—Dredged at Station 75 (off Fayal, in the Azores), July 2, 1873; lat. 38° 38′ N., long. 28° 28′ W., depth, 450 fathoms; surface temperature 70°·0; sea-bottom, volcanic mud.

A specimen of medium size (about 48 mm. long and 6 mm. in breadth at its widest part). It is incomplete posteriorly.

The snout has more than the thirteen rings mentioned by Ehlers, but he also indicates doubts on this point. Sixteen or seventeen rings appear to be present in this form. In the toughness and aspect of the skin it approaches *Glycera capitata*. No eyes are visible.

A form very similar to the foregoing occurs at Station 142 (off the Cape of Good Hope), December 18, 1873; lat. 35° 4′ S., long. 18° 37′ E.; depth, 150 fathoms; bottom-temperature, 47°·0; sea-bottom, green. It agrees closely with the typical *Glycera tesselata*, Grube, except in the presence of dusky yellowish pigment at the tips of the feet, especially in front.

A curious feature in this example is the occurrence of numerous minute Nematoids in little masses of epithelial debris in the extruded proboscis.

In the body-cavity of the specimen from Fayal a membranous mass contained numerous dark grains (probably cinders), sand particles, one or two Foraminifera and sponge-spicules, and tufts of the bristles of a *Glycera*, which had escaped by rupture from the alimentary canal.

In a transverse section of the middle of the extruded proboscis of the same example, the regularity of the muscular bands is noteworthy. Beneath the densely papillose inner surface is a series of fibres which have internally lozenge-shaped spaces between the longitudinal bundles. The latter are rounded externally, flattened internally, and the cut ends of the fasciculi have a somewhat radiate arrangement. Between the outer investment and the former coat is a strong circular layer. The posterior region of the proboscis forms a quadripartite series of folds, which evidently have a thick cuticular covering.

The distribution of *Glycera tesselata* would appear to be wide, for it stretches from the Shetland Islands to the Madeiras.

Glycera capitata, Œrsted.

Habitat.—Dredged at Station 75 (off Fayal, Azores), July 2, 1873; lat. 38° 38′ N., long. 28° 28′ W.; depth, 450 fathoms; surface temperature, 70°·0; sea-bottom, volcanic mud.

A closely allied form comes from Station II. (off Setubal), January 13, 1873 ; lat. 38° 10′ N., long. 9° 14′ W.; depth, 470 fathoms ; surface temperature, 57°·0 ; sea-bottom, green mud. The distribution of this common form is very wide.

The first-mentioned is of average size, and the snout, which is of fair length, is marked by a median longitudinal groove. The anterior feet have a somewhat large dorsal cirrus with a globular extremity, and a small dorsal process of the foot proper, which does not extend so far outward as the setigerous lobe of the division. Beneath are the somewhat large inferior setigerous lobe, and a long lanceolate process which projects far beyond the latter ; while ventrally the lower lobe has a broad point.

The simple superior bristles are very distinctly serrated along the edges. The inferior compound bristles are characterised by a marked irregularity in size, the shafts of the upper being about thrice the thickness of some of the others. The terminal pieces of these are comparatively short and distinctly serrated. A similar proportion exists in the lower group of the inferior bristles, except that the thickest are ventral instead of dorsal. The same arrangement is observed in the British examples of the species.

Posteriorly all the processes of the body are elongated, but the bristles retain the characters just described.

In the example from Station II. the structure of the foot is essentially similar, as is also the disproportion in the size of the shafts of the bristles, but the dorsal simple bristles and the tips of the inferior are very much longer.

In transverse section the small example from Station 75 presents cords more distinctly separated than usual, and the ventral sulcus between the attachments of the strong circular coat is broader than in the ordinary form. The papilla above the foot is globular, and has a narrow pedicle. Reproductive elements appear above the bases of the feet.

The specimen procured off Setubal is so distended, apparently by the reproductive products, that the structure of the body-wall is indistinct.

Glycera kerguelensis, n. sp. (Pl. XXXVa. figs. 3, 4).

Habitat.—Dredged at Station 149H (off Christmas Harbour [?], Kerguelen), January 29, 1874 ; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms ; surface temperature, 39°·8 ; sea-bottom, volcanic mud.

The specimen is about 45 mm. in length and 5 mm. in breadth at its widest part.

In external appearance this form very much resembles *Glycera capitata*, though towards the tips of the posterior feet there is more brownish pigment.

The intestine contained a brownish mass consisting of bristles of Annelids, numerous Diatoms, a few sponge-spicules, and sand-grains.

The body-wall of this example shows decided differences from the typical *Glycera capitata*, and indeed it is evidently a distinct species. Thus the nerve-area (Pl. XXXVa. fig. 3), instead of reaching the inner border of the ventral longitudinal muscle, has a thick layer of fibres on its upper (inner) border. Moreover, in the latter the cords are more distinct. No neural canal is visible. The proboscis is typical in structure, but the papillæ (Pl. XXXVa. fig. 4) are considerably longer and more slender than in *Glycera capitata*.

Glycera amboinensis, n. sp. (Pl. XLII. figs. 6, 7).

Habitat—Dredged in 15 fathoms, near Amboina.

A small specimen, about 33 mm. long and 3 mm. in breadth. It much resembles the common British form, which is closely allied to Grube's *Glycera tesselata*.

The general aspect and the snout very much resemble the latter, and the same may be said of the extruded proboscis, though the conical papillæ are larger than in the British species, and the bases of the teeth diverge.

The structure of the feet anteriorly is also similar, and the dorsal cirrus has nearly the same position. The feet, however, are imperfectly preserved, so that deductions on this head must be correspondingly guarded. At the tenth foot there are two elongate and somewhat lanceolate upper lobes, the superior having a dorsal curvature towards the tip. Both are acutely pointed, as is also the shorter ventral lobe. The bristles are decidedly longer than in the British form, and the tips of the inferior series more slender and arcuate. Moreover, in the British species the posterior feet differ considerably and possess branchiæ, whereas in this they appear to be very similar to the anterior. In both the serratures on the edge of the dorsal and the terminal piece of the ventral bristles are more distinct in the posterior feet. The comparative length of the bristles remains the same, that is, they are much longer in the present species.

In transverse section the body-wall is so attenuated by distension of the pervisceral cavity that the muscular layers are imperfectly exhibited. The nerve-area is wide and bilobed, and the disposition of the external circular coat diverges from that in *Glycera capitata*. It seems to be less developed.

The *Glycera decipiens* of Marenzeller from Southern Japan has a foot similar to the foregoing, but it bears a large branchial process, and is, on the whole, somewhat shorter and deeper, and the ventral cirrus differs in outline, so that even in a form devoid of branchiæ (an occasional occurrence) the distinction would be evident. It also approaches *Glycera tesselata*, Grube. The latter author's *Glycera rutilans*, from Ceylon, seems to be an allied form, but the condition of the specimen in the British Museum

is such that it would be unsafe to say more. The foregoing forms and the *Glycera brevicirris* of Grube all show certain resemblances.

Glycera sagittariæ, n. sp. (Pl. XLII. fig. 8; Pl. XXIIA. fig. 10).

Habitat.—Dredged on September 29, 1874, off Arrou Islands.

An elongated annelid, tapering much posteriorly, and measuring about 110 mm., with a diameter of 5 mm. at the widest part, near the anterior third.

There is little in the contour of the head and body to discriminate the species. The teeth, which are admirably concealed on retraction of the proboscis, have a long slender process on one side of the base.

The feet are formed on a similar plan to those of the British species which so closely resembles *Glycera tesselata*, but in addition to the difference in regard to the branchiæ (which are present in the Challenger specimen) there are other distinctive features. In comparing the tenth foot of the two forms it is found that in the foreign example the dorsal cirrus is at a greater distance above the foot, that the two long processes of the foot are less bulbous towards the tip, and that the ventral lobe is proportionally broader. The tips of the ventral bristles also appear to be larger. A little beyond the thirtieth a branchial process springs from the upper and anterior part of the foot, and it continues for a considerable distance, being at first short and thick, and then somewhat elongate.

There is not much in the structure of either dorsal or ventral bristles to distinguish them from the British form, except, as already noted, the somewhat longer terminal piece of the ventral. Both the latter and the dorsal show indistinct serrations along the margin. The tips of the ventral bristles of this and other Glyceridæ seem to be triangular in transverse section, that is, they have a keel posteriorly, and two serrated margins in front. Moreover, from the formation of the bristle it is difficult to get a good lateral view (so as to show the entire side), and in most views the double line indicates the nature of the anterior edge. The tips of the upper ventral (Pl. XXIIA. fig. 10) are longer than those of the inferior series.

A dark brownish mass in the perivisceral cavity consisted of granules and numerous slender hairs (bristles).

This species closely agrees with *Glycera capitata* in the structure of the body-wall, though the nerve-area is less pointed superiorly, indeed, it forms beneath the granular outer layer of the region a smoothly rounded arch with two small but distinct neural canals superiorly. The papillæ of the proboscis are slightly longer than in *Glycera capitata*.

In the form of the foot this species resembles Grube's *Glycera saccibranchis*,[1] from

[1] Annelidenfauna d. Philippinen, p. 181, Tab. viii. fig. 1ff.

the Philippines, but the branchial process is always simple, instead of being bifid or trifid. The same remarks apply in the case of Grube's *Glycera subænea*.[1]

Glycera lamelliformis, n. sp. (Pl. XLII. figs. 9, 10; Pl. XXIIA. fig. 11).

Habitat.—Dredged at Station 167A (Queen Charlotte Sound, Cook Strait, New Zealand), June 27, 1874; lat. 41° 4′ S., long. 174° 19′ E.; depth, 10 fathoms; surface temperature, 51°·5; sea-bottom, mud.

A fragment of the anterior part of a somewhat large species, and measuring about 70 mm. without the extruded proboscis, which is 30 mm. long. A smaller incomplete example is also present.

The snout is characterised by its brevity, eight or nine rings only being visible. The proboscis is covered with very fine papillæ, which have a conical form. Besides these uniform small papillæ, larger ones are scattered amongst them all over the organ. A slight duskiness occurs on the snout and anterior region, and the entire body is marked by the usual minute folds and creases. A narrow median line runs along the dorsum, and a broader one occupies the middle of the ventral surface.

The feet are characterised by having two long anterior and two shorter posterior processes. At the tenth foot the large dorsal cirrus is situated a little above the base of the organ. The upper anterior lobe is almost foliaceous in appearance, forming a large ovato-lanceolate organ, acutely pointed at the tip, which is also bent upward. The next process, only a little less prominent, has a similar shape, and the tip is bent downward. The two posterior processes of the foot also have a tendency to be lamelliform, but project much less than the foregoing. The ventral cirrus is broadly lanceolate. The foot increases in length toward the twentieth, but again becomes comparatively short and broad toward the thirtieth, the foliaceous condition of the lamellæ, however, being well-marked. The posterior processes are further proportionally larger. Toward the fiftieth, the foot is still short and deep. A rounded process, moreover, appears between the dorsal cirrus and the base of the foot, but the precise nature of this (unless it be branchial) is doubtful. It increases in size toward the ninetieth, and continues throughout the specimen. In this region the anterior and posterior processes of the feet are more nearly equal in length, the anterior, however, being more distinctly foliaceous. At the posterior part of the fragment, again, the foot has a process inferiorly, just behind the lamelliform ventral cirrus, the base of the latter projecting beneath the margin of the foot.

The dorsal bristles have no special features other than that the minute serratures on the anterior margin are very distinct. In some cases a splitting for a short distance (probably from wear) takes place along the anterior edge, so that the latter appears bobbly

[1] *Op. cit.*, p. 184, Tab. viii. fig. 8.

spinous. The presence of the normal serratures along these adventitious processes, however, shows their real nature.

The inferior bristles have long, tapering, serrated tips, and a peculiar articulation with the shaft (Pl. XXIIA. fig. 11), which presents a slight constriction, and then a curvature below the extremity. In the ordinary position under examination (as in the figure), the opacity at the base of the terminal whip is caused by its overlapping the long process at the end of the shaft.

The small form accompanying the preceding, while agreeing in general appearance, differs in having branchiæ, which are rather long, simple processes, commencing on the thirty-second foot, and continuing to the sixtieth. The structure of the feet is otherwise similar. The inferior bristles, however, differ slightly at the articulation between the shaft and tip, but probably this is due to the age of the example.

The section of the body-wall of the large specimen presents certain resemblances to *Glycera capitata*, the nerve-area in both passing from the hypoderm to the inner border of the ventral longitudinal muscles. The oblique fibres bounding the inner border of the latter decussate over its summit. The shape of the area above the transverse inferior region, however, is more distinctly ovoid, and within the pale outer investment of the area is a well-marked granular ring split into two divisions by a central streak. Two neural canals exist superiorly. A feature very slightly indicated in *Glycera capitata* is here very evident, viz., the demarcation of an inner division of the longitudinal ventral muscles on each side of the nerve-area, by a triangular granular region on the internal border opposite the commencement of the external circular coat. The latter is strongly developed. The extruded proboscis agrees in structure with the British species just mentioned, and the papillæ are proportionally about the same size. The smaller example does not show the internal division of the ventral longitudinal muscles so distinctly, but otherwise is identical in structure.

A species of *Glycera* dredged at Station 174c (south of the Fiji Islands), August 3, 1874, seems to be very closely allied to the foregoing. The Station indicated is in lat. 19° 7′ S., long. 178° 19′ E.; depth, 610 fathoms; bottom temperature 39°·0, surface temperature 78°·0; sea-bottom, coral mud.

The specimen is both injured and incomplete. The total length (exclusive of the exserted proboscis) is about 45 mm., with a breadth of 3·5 mm. across the feet at the widest part anteriorly. Its condition is such that a minute description would mislead. It appears, however, to be very near the foregoing, the chief distinctions being the deeper yellowish hue of the bristles, the somewhat longer snout, and the earlier commencement of the branchiæ on the anterior segments. The papillæ of the proboscis are very similar.

In section this softened specimen differs from the former species (*Glycera lamelliformis*) in the more evident differentiation of the internal part of the ventral longitudinal

muscle on each side, and the increase of the muscular fibres over the nerve-area. The latter by means of a dorsal process touches the inner surface, but on each side of this pedicle the muscular fasciculi cover the arch. The example is softened, and therefore the necessary conditions for accuracy are absent.

The *Glycera mertensii* of Grube,[1] from Laventuka, seems to approach the foregoing in regard to the foliaceous condition of the feet.

Hemipodus, De Quatrefages.

Hemipodus (*?*) *magellanicus*, n. sp. (Pl. XLII. figs. 11–15; Pl. XXIIA. figs. 12–15; Pl. XXXVA. figs. 5, 7).

Habitat.—Dredged in considerable numbers in the Strait of Magellan, at Station 306A, January 2, 1876; lat. 48° 27′ S., long. 74° 30′ W.; depth, 345 fathoms; bottom temperature 46°·0, surface temperature 57°·5; sea-bottom, blue mud.

Also at Station 310 (in the Strait of Magellan), January 10, 1876; lat. 51° 27′ S., long. 74° 3′ W.; depth, 400 fathoms; bottom temperature 46°·5, surface temperature 50°·5; sea-bottom, blue mud.

The larger specimens appear to range in length from 65 to 70 mm., with a diameter (across the bristles) at the anterior swelling of 5 mm.

The species is broadly characterised by its somewhat dusky hue, the bulky snout, boldly marked with pigment, the large tentacles, short densely villous proboscis, and the structure of the feet and bristles.

In the preparations the body shows a short dilatation a little behind the snout, and it tapers from this point to the tail. The diminution anteriorly, again, is somewhat abrupt, and the short truncated snout with its pigment gives the region a characteristic appearance.

The snout is separated from the body by a marked circular constriction, and consists of a great basal ring and five terminal. The basal ring is encircled posteriorly by a deep brownish pigment-belt, which in the median line, dorsally and ventrally, sends forward a broad process extending to the anterior border of the second ring. No trace of an eye is present, but the lateral region at the base of the snout has on each side a large pale patch. On the ventral surface, again, a very distinct pale speck occurs on each side, just behind the second ring. The next four rings are minute; the fifth is truncated anteriorly and bears the four tentacles, which are the largest (comparatively) in the group. Two spring from the dorsal and two from the ventral margin of the truncated snout. Each is a simple subulate process without a trace of articulation. The

[1] *Jahrb. schles. Gesellsch.*, 1868, p. 5 (sep. Abd.).

tips are pale, and have the translucent minutely granular appearance observed in the finely tactile processes of other Annelids.

The proboscis is remarkably short, forming a cup-shaped organ in extrusion, and densely villous under a lens. When more highly magnified the papillæ appear very elongate, almost linear, the tip, however, being slightly bulbous. All are marked by longitudinal bands, apparently fibres, and are densely granular. The tips of many exhibit slight processes, as if from palpocils, or the extrusion of the secretion after immersion in spirit. Like the tentacles these papillæ are the longest yet observed in the group. The four teeth are remarkably short, curved, and sharp. They differ from those of *Glycera tesselata* (from Fayal, Azores) in the form of the base, for the long slender and nearly horizontal arm shows no marked projection towards the median line (of the proboscis) where it joins the base of the fang. Moreover, the direction of the base-line on each side is more nearly horizontal than in the common form.

The feet diverge from those of the ordinary Glyceridæ. At the tenth the dorsal cirrus is considerably elevated, and has the form of an ovoid pedicellate process. The foot is nearly sessile, and bears anteriorly a dorsal lamella of considerable length, the tip being narrower. A shorter inferior process of a similar shape also occurs. Posteriorly the corresponding structures are short and rounded. Ventrally is a well-marked ovate lamella, much resembling the corresponding organ in the Phyllodocidæ, to which family, indeed, the short head of this species and the bristles of all somewhat approach. The variations of the foot from the foregoing to the nineteenth consist of a gradual diminution of all the processes, and the more sessile condition of the entire organ. Two spines occur in the latter.

The dorsal bristles (*e.g.*, of the twentieth foot) are simple, slender, elongate, and nearly of the usual structure. They are, however, much more boldly serrated along the edge than any yet seen. The lower ones also show a slight hook at the tip, and are less slender (Pl. XXIIA. fig. 12). The surface, moreover, is slightly though minutely spinous.

The ventral bristles in the same foot form two very distinct groups. The superior have longer tips than the inferior, but even these are considerably shorter and stouter than any hitherto observed in the Glyceridæ. Their shafts have nearly the ordinary structure, while the terminal process is sabre-shaped (Pl. XXIIA. fig. 13), and the edge is not only boldly spinous, but the surface of the process is minutely hispid, and a tendency to this condition appears in other groups of bristles. A slight hook also occurs at the tip, especially in the lower forms.

The inferior ventral bristles present short, broad tips, spinous at the edge and over the surface, and have a distinct terminal hook. The superior and inferior possess longer tips than the central (Pl. XXIIA. fig. 14). The upper ends of the shafts have two very strong articular processes in front.

Posteriorly the terminal pieces of the dorsal bristles are more evidently spinous. In the lower ventral series, again, the great increase in size of the shafts and their articular processes, and the shortening of the terminal pieces, are most noteworthy. About the ninetieth foot there are generally three in the inferior ventral series, one of which is represented in Pl. XXIIA. fig. 15. The sabre-shaped upper ventral bristles are little altered either in form or size, and much resemble that shown in fig. 14.

In this form the cuticle is thin, but the hypoderm is more decidedly developed than usual, and it is further the seat of the brownish-red pigment. The circular muscular coat is thinner, but its disposition is similar. The dorsal longitudinal muscles are separated by the attachment of a strong band of median fibres. The nerve-area shows certain peculiarities; thus when the section is made through a ganglion (Pl. XXXVA. fig. 6), the area is broad above and narrow below, the two neural canals being situated near the upper border. Internally (superiorly) the area is invested on each side by a large muscular mass formed by a differentiation of the inner region of the ventral longitudinal muscle, which also shows the division formerly mentioned. When, however, the section is made in the anterior third of the body between the ganglia (Pl. XXXVA. fig. 7), it is found that the cords are separated by a strong band of muscular fibres, apparently connected with the alimentary canal, which pass between them to the hypoderm. Each nerve-cord is somewhat ovoid, and has a neural canal at its upper and inner border.[1] The reproductive elements (ova) appear at the outer borders of the ventral longitudinal muscles at the bases of the feet. The hypodermic region of the proboscis is tinted of the same reddish-brown hue as that of the body-wall.

Those authors (De Quatrefages, Kinberg, Ehlers, and Grube) who have examined *Hemipodus* agree in stating that there is only one bundle of jointed bristles, but the two groups are clearly shown in every foot of the present form, and it is possible that in some cases the smaller upper bundle has been overlooked. Moreover, whilst anteriorly a single spine exists, two are conspicuous posteriorly.

The description of Kinberg's *Hemipodus patagonicus*, from York Bay, Strait of Magellan,[2] is so indefinite that identification is uncertain, though both have the buccal segment dilated posteriorly. No branchiæ occur in the present form. Both Ehlers[3] and Grube[4] allude to the distinctive characters and distribution of Schmarda's species from the west coast of South America. The genus *Hemipodus* of De Quatrefages[5] and these authors, indeed, is confined to the region mentioned.

[1] Prof. E. Ray Lankester (*Ann. and Mag. Nat. Hist.*, ser. 4, vol. xi. p. 92, 1873) is of opinion that the arrangement of the nerve-cords and their sheath with the supporting muscles in *Glycera* offers certain relations to the vertebrate notochord. Many Annelids resemble *Glycera* in the disposition of the nerve-cords.

[2] *Öfversigt k. Vetensk.-Akad. Förhandl.*, Ärg. 22, No. 4, p. 245.

[3] Borstenwürmer, Bd. ii. p. 645. [4] *Op. cit.* [5] Annelés, t. ii. p. 194.

Family Ariciidæ.

The Ariciidæ would not appear to be frequent in the expeditions hitherto recorded. Thus none occur in Grube's Annulata Œrstediana, none in his description of those from the "Gazelle," and only a single *Aricia* is described by Schmarda. Though some occur at very great depths, as, for instance, *Aricia norvegica*, still others frequent the shore between tide-marks, and therefore might have been the more easily procured. It is not a group, however, that would readily be noticed, unless specially looked for. Sand, often very coarse sand, forms the chief contents of the alimentary canal.

Aricia, Savigny.

Aricia norvegica, Sars.

Habitat.—Dredged at Station 47 (off the coast of New York), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; surface temperature, 42°·0; sea-bottom, blue mud.

A fragment of the anterior end, measuring about 12 mm. in length and 2·5 mm. in breadth.

The snout and anterior region agree with these parts in *Aricia norvegica*, Sars, of which it seems to be a variety. The first four bristled segments are devoid of branchiæ, which commence on the fifth.

A variety of the same form was procured in the trawl off Rio San Francisco, September 12, 1873, in 1200 fathoms; lat. 10° 46′ S., long. 36° 2′ W.; sea-bottom, mud.

This consisted of a fragment of the anterior region, 18 mm. in length and 3 mm. in diameter. While agreeing in most respects with *Aricia norvegica*, it is observed that the double external process of the foot has a longer pedicle, and the tips of the large spear-shaped brownish bristles of the posterior serrated segments (13–15) are, in some cases, slightly bent. A tendency to the latter, however, is sometimes noticed in Norwegian examples of *Aricia norvegica*.

In the section of this form the cuticle is comparatively thin, but the hypoderm is moderately developed, especially on the dorsal and lateral regions. The circular coat is well-marked inferiorly, but it is broken up laterally at the feet; while dorsally strong bands pass from it vertically through the dorsal longitudinal muscles, which are thus cut into separate fasciculi. The dorsal muscles are much less than the ventral longitudinal, and their shape is somewhat ovoid. The ventral muscles again are elongate in transverse section, and are firmly bound by the circular coat externally and the oblique muscles internally. Vertical fibres also separate them into narrow fasciculi. The powerful oblique

muscles meet over the nerve-area, and are especially prominent above the latter in the interganglionic regions. The nerve-area is bounded laterally by the longitudinal ventral muscles, and has the circular coat, hypoderm, and cuticle externally. As in the genus *Scoloplos*, a single neural canal is visible quite at the upper border of the area in some preparations. A large blood-vessel occurs in the median line dorsally and ventrally, and the vascularity of the entire body-wall is great.

This species appears to have a very wide distribution, stretching from the Norwegian shores into the Atlantic, and as far as the American shores.

Aricia platycephala, n. sp. (Pl. XLIII. figs. 1–3; Pl. XXIIa. figs. 16, 17).

Habitat.—Found between tide-marks at Bermuda.

The example consists of a fragment of the anterior region having a length of 38 mm., and a diameter of fully 4 mm. about a quarter of an inch behind the snout.

The snout (Pl. XLIII. fig. 1) is flattened and spathulate, and therefore characteristic. A little pigment is present just within the anterior margin. The anterior feet, from the absence of papillæ, appear somewhat bare. The first is small and bifid, each division having a few stout bristles. The second has a long dorsal appendage (cirrus) behind the bristle-tuft, and an elevated setigerous region with two processes posteriorly. There is only one of the latter at the third foot, and it soon becomes extended vertically into a somewhat crenate and not very prominent fold, provided with a papilla superiorly, the homologue of the pectinate rows of the ordinary form. The dorsal bristles are less conspicuous than in the latter, and most are broken. So far as can be observed, they consist of a stronger series of serrate yellow bristles with smooth basal regions, and numerous shorter and more slender forms of similar structure. At the tenth foot (Pl. XLIII. fig. 2) the dorsal cirrus has a large basal swelling, chiefly external. The stout bristles of the inferior series are arranged in four vertical rows on the flattened pad, the strongest being anterior. The general arrangement seems to be the following:—The two outer series (anterior and posterior) are continuous, with a small curve superiorly, each extending downward and expanding as it goes, the anterior, however, being the larger. The two middle rows also slightly expand inferiorly, the whole having a very regular aspect. The typical bristles of this row have long deeply set shafts, which somewhat increase in strength superiorly, and terminate in powerful, curved tips (Pl. XXIIa. fig. 16), which are easily distinguished by their brownish colour. The stoutest bristles of this series show slight traces of crenations on the convex edge, but these may be absent, as in the figure; while others (the more slender) have a terminal region more or less boldly serrate (Pl. XXIIa. fig. 17). Their relationship with the ordinary spinous or serrate kinds is thus evident. Inferiorly, indeed, are several long serrate bristles.

The foregoing structure may be said to be characteristic of the anterior feet. Thereafter the inferior bristles gradually become more slender, and the rows are shorter and mostly in a single line. At the thirtieth foot the following condition occurs :—Superiorly is the branchia, then a lanceolate and flattened dorsal cirrus, with a slight external convexity at its base. The long spinous bristles with smooth shafts exist in front; then a similar series are present in the ventral division, interspersed with a few stoutish and slightly curved hooks as before, only they are more slender. Behind the latter bristles is the short and somewhat conical cirrus.

At the posterior end of the fragment the stoutish ventral hooks are even more slender, and this is the chief change in bristle-structure.

The branchiæ commence as small lanceolate processes on the eighth bristled segment, and they remain comparatively small till about the eighteenth segment.

The alimentary canal contained masses of coarse shell-debris, sand, and a few Foraminifera.

In transverse section the cuticle is thin, while the hypoderm is dense. The latter forms a firm layer of streaked areolar tissue, somewhat resembling that in the Nemerteans, though considerably closer in texture. Brownish pigment occurs in this layer in the dorsal median line. The circular muscular coat is of average thickness. Instead of the rounded or ovoid dorsal muscles of *Aricia norvegica*, this species has flat muscles in section, thickest externally where each forms a somewhat rounded lobe, and separated internally by the pedicle for the blood-vessels and alimentary canal. They are also cut into fasciculi by the vertical fibres which pass through them, and again unite on their inner surfaces with neighbouring bands so as to form a closely interwoven layer. The ventral longitudinal muscles are much larger, but similarly extended, and pierced by the vertical fibres, which also unite to form a layer of closely mixed fibres internally. The oblique muscles are much more slender than in *Aricia norvegica*, a feature probably connected with the great development of the sheet of vertical fibres just mentioned. The nerve-area is bluntly conical, its investment resting on the circular muscular layer externally, and having the large ventral blood-vessel and the inferior pedicle of the alimentary canal internally (superiorly). The alimentary canal forms a finely folded glandular tube anteriorly. The entire body is flattened from above downward.

Aricidea, Webster.

Aricidea fragilis, Webster (Pl. XLIII. figs. 4, 5; Pl. XXIIa. fig. 18).

Aricidea fragilis, Webster, Ann. Chætopoda of the Virginian Coast, p. 55, pl. ix. figs. 127–132.

Habitat.—Dredged at Station 47 (off the American coast, near New York), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; surface temperature, 42·0; sea-bottom, blue mud.

A fragment of the anterior region, comprising about thirty-six segments. No eyes are visible.

All the bristles are smooth, except the stout forms on the anterior segments, which show faint transverse markings near the tip. In the same somites a series of long forms with peculiarly bent acuminate tips occur. These appear to take the place of the transversely barred bristles in *Aricia*. The stouter bristles are also remarkable for their long acuminate extremities. In the long and peculiar curved bristles, *e.g.*, from the tenth foot (Pl. XXIIa. fig. 18), the tip is generally incomplete. Such would seem to lead on to the bristles met with in *Scoloplos*.

The disproportion between the dorsal and ventral muscles is still evident in this form, the first mentioned being thick externally in section and somewhat pointed internally, while the ventral are deepest in the middle, and slightly diminished at each end. Both are perforated by vertical plates of muscle. The oblique muscles are of moderate bulk and spread over the nerve-area. The latter forms a comparatively large flattened ovoid mass beneath the thin basement-tissue of the region, and presents traces of two small neural canals superiorly. Externally (ventrally) is the thick hypodermic layer, which is specially increased in bulk in the central region, so that the nerve-cords are placed at a distance from the surface. The hypoderm is thinner on the dorsal arch, but is much developed laterally. The alimentary canal has a somewhat thin wall, and is attached by muscular fibres to the median line dorsally and ventrally, the pedicle in each case being comparatively short. In the preparations the tract forms a narrow vertical chamber, the external region having a very slight muscular development.

Scoloplos, (Blainville) Œrsted.

Scoloplos kerguelensis n. sp. (Pl. XLIII. figs. 6–8; Pl. XXIIa. fig. 19).

Habitat.—Dredged at Station 149G (off London River, Kerguelen), January 29, 1874; lat. 48° 50′ S., long. 69° 18′ E.; depth, 110 fathoms,—in company with various other Annelids and a *Caprella*. A fragment was also obtained off Christmas Harbour, in the neighbourhood; depth, 120 fathoms; surface temperature, 40°·2; sea-bottom, volcanic mud.

The specimens are fragmentary, ranging from 10 to 20 mm., and having a diameter of rather less than 2 mm.

The snout (Pl. XLIII. fig. 6) is less pointed than in *Scoloplos armiger*, and one of the examples shows a transverse group of brown pigment-granules a little in front of the posterior border of the first segment. The special bristle-bearing region anteriorly is much shorter than in the common form, while the bristle-tufts are longer. There are

nine of these segments, which are characterised by having a dorsal and a ventral cirrus of nearly equal size. The tenth shows the large ventral process characteristic of the subsequent segments, though it is more ventral in position, and has not attained the development it afterwards assumes. Minute branchiæ of the usual form appear on the twelfth bristled segment, and slowly increase in size from before backward.

The anterior feet present a dense tuft dorsally and ventrally of the same kind of bristles as in *Scoloplos armiger*, viz., transversely barred forms (Pl. XXIIa. fig. 19), only they are much longer, and it is to be noted that the appearance of such bristles varies considerably according to the adjustment of the focus. Toward the termination of the region (*i.e.*, about the twelfth and thirteenth somites) these bristles have increased considerably in length, though they are much less numerous. A few of the dorsal are extremely elongated, with the transverse markings distinct and wide apart. The latter kind only remain in the ventral tuft of the twentieth foot, and, so far as the examples show, a similar arrangement exists posteriorly.

After the transition of the feet anteriorly is fairly accomplished, we have from above downward, first the tongue-shaped branchia, then the filiform dorsal papilla (which at the twentieth foot is only a little longer than in front), and lastly the double ventral process on the pedicle. In contrast with the foot of *Scoloplos armiger*, there are in the Challenger form much longer bristles, a filiform dorsal cirrus, instead of one dilated above the basal pedicle, and the ventral (double) process is shorter and thicker than in the common species.

The intestine contained a quantity of dark sand.

The body of this species presents in section a decided difference from that of *Scoloplos armiger*, in which the greater part of the area is filled up by muscles. Externally is a thin but firm cuticle, which exactly in the centre ventrally has a linear thickening. The hypoderm has the same proportional depth as in the British form just mentioned, and is also increased in the subneural region. The circular muscular coat is less developed than in the latter species. The longitudinal ventral muscles form in section long flat bands on each side of the nerve-area, and stretch far upward laterally. The dorsal are somewhat less. Both are distinguished from the condition in *Scoloplos armiger* by the absence of the densely interwoven vertical muscles which occupy the entire area with the exception of the limited central alimentary region. The nerve-area is proportionally large and rounded, has the circular layer externally, and is clasped internally between the longitudinal ventral muscles. The region thus contrasts strongly with that in *Scoloplos armiger*, which lies beneath the powerful and nearly horizontal oblique muscles, with the vertical fibres bounding it laterally, and the massive circular layer externally. In the new form, therefore, the muscular environment is less striking. The central space of the body is occupied by large folds of the alimentary canal.

Family Opheliidæ.

The members of this family would seem for the most part to frequent shallow water, though in the "Valorous" expedition one species was found at a depth of 1785 fathoms. With the exception of the voyage of the "Eugenie," where six examples of the family are given, the representatives in collections are generally few. Thus only a single form, *Travisia*, is mentioned by Schmarda, while Grube has two (*Ophelina* and *Polyophthalmus*) in the Philippine series.

Ammotrypane, H. Rathke.

Ammotrypane gracile, n. sp. (Pl. XLIII. figs. 9, 12).

Habitat.—Dredged off Japan, lat. 33° 56′ N., long. 130° 27′ E., at a depth of 30 fathoms.

An elongated slender form, which measures about 23 mm. in length and a little more than 1 mm. in breadth.

It requires careful inspection to discriminate this form from the European *Ammotrypane aulogaster*. There are, however, three filaments at the base of the proboscis anteriorly, instead of two (on a pedicle) as in the latter species. The ventral processes beneath the arch of the tail are also shorter and more rounded at the extremity. The dorsal process of the tail is also short, but the posterior filaments resemble those in the common form. The branchiæ and bristles are similar, and the short (rudimentary) cirrus of the foot likewise corresponds.

In the intestine is sandy mud, containing numerous Diatoms, broken sponge-spicules, fragments of very small spines of Echinoderms, and one or two minute Foraminifera.

The body-wall agrees generally with that in *Ammotrypane aulogaster*, but the intermediate pedicle (between the dorsal and ventral longitudinal muscles) is short. The cuticle is dense, especially in the median line ventrally, while the hypoderm is very feebly developed. The somewhat ovoid nerve-area, which occupies the lower region of the pedicle, is much larger than in the British species just mentioned, in which it is almost in the form of a transverse band. The longitudinal dorsal muscles do not present such regularly arranged fasciculi superiorly in the new form as those in *Ammotrypane aulogaster*, which slant obliquely along the dorsal arch, from a kind of median raphe.

Travisia kerguelensis, n. sp. (Pl. XLIII. fig. 10; Pl. XXXVIa. figs. 1, 2).

Habitat.—Dredged at Station 149, in Betsy Cove, Kerguelen, at a depth of 25 fathoms, and apparently in peculiarly odoriferous mud, since the specimens still retain the scent. *Nephthys* and *Brada* were its companions in this habitat.

A large example measures about 20 mm. in length, with a diameter at its widest part of fully 7 mm.

The specimens have the usual dull whitish colour of the European *Travisia forbesii*, and appear minutely dotted under a lens from the glands. The number of segments is about the same as in the species just mentioned, viz., twenty-three, and in other respects the resemblance is close. In the Challenger form, however, the rings of the segments differ, and posteriorly the two last have a crenated margin dorsally, while the segment anterior to these also shows a few lateral pectinations. Moreover, the dorsal cirri are shorter, as are also the lateral caudal processes (Pl. XLIII. fig. 10).

The intestine is filled with dark sand, the coarse grains of which are covered over with numerous circular ova having a granular and probably adhesive investment for attaching them to the fragment, and tessellated here and there with smaller clear ovoid bodies; while other sand-grains are hirsute with Diatoms. There is good reason, therefore, why this peculiar sand should be so utilised by the animals.

In section the characteristic condition of the cuticular tissues of the genus is strongly marked in this form. When viewed laterally the surface seems to be formed by a closely arranged series of papillæ (Pl. XXXVIA. fig. 1) with narrow pedicles, the whole resembling a series of closely arranged wine-glasses, for the narrow stem arises from an elevation of the tissues beneath. A careful examination, however, shows that the cuticle envelops each of these goblet-shaped papillæ, being thickest in the interseptal regions, and forming the main part of the stem, which is thus translucent. The stems merge into the cuticular coating of the inner region of the hypoderm, which is fibro-granular. The external part of the hypoderm (constituting the bowl of the wine-glass) is coarsely granular and opaque, and apparently represents the outer or glandular part of the hypoderm split up into many divisions by the envelopes of cuticle. When viewed from the surface (Pl. XXXVIA. fig. 2) the skin is thus made up of a vast series of somewhat hexagonal facets. The spaces around the stems of the goblets probably subserve the same functions as the smaller and more numerous areolæ in the hypoderm of other forms. The circular fibres beneath the hypoderm are not much developed. The longitudinal muscular layers seem to be nearly continuous. The ventral longitudinal are separated only by a narrow pedicle, to which is attached the somewhat triangular nerve-area, the latter having a straight superior border of firm tissue (sheath), to the outer angles of which the oblique muscles are attached. The cords are rounded in transverse section. The central region of the body is occupied by voluminous folds of the alimentary canal. The nerve-area in this form thus slightly deviates from that in *Travisia forbesii*, which is situated between and somewhat above the oblique muscles, while other fibres are attached to the upper and outer curves of the region.

In the structure of the skin this form somewhat approaches *Travisia glandulosa*,

procured at a depth of 1785 fathoms by the late Dr. Gwyn Jeffreys during the Arctic cruise in the "Valorous."[1]

Family Scalibregmidæ.

The Scalibregmidæ seem to be somewhat less common than the foregoing family in collections. No species is mentioned by Grube in the "Gazelle," and none appear amongst the Philippine series of Semper. None was found by Schmarda, and the same may be said of Kinberg. The occurrence of only two in the collection of the Challenger is therefore a fair representation of the family.

As a rule they frequent muddy ground, and some reach considerable depths; for instance, *Scalibregma inflatum*, from the cold area, at 412 fathoms in the "Norske Nordhavs-Expedition." They are, however, more abundant in the shallower waters.

Scalibregma, H. Rathke.

Scalibregma inflatum, H. Rathke, var. (Pl. XLIV. figs. 3, 4; Pl. XXIIa. fig. 21).

Habitat.—Dredged in considerable abundance at Station 141 (between Prince Edward Island and Kerguelen), December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms; bottom temperature 49°·5, surface temperature 65°·5; sea-bottom, green sand.

Apparently the same form was trawled at Station 169 (off the north-west corner of New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; sea-bottom, blue mud.

The specimens are all much smaller than the European *Scalibregma inflatum*, the longest measuring about 18 mm., with a breadth at the anterior thickened region of nearly 4 mm.

When compared with the European form of similar size, the foreign species has a more fusiform outline and much less of the inflation anteriorly. The branchiæ are similar, but in the Norwegian examples these are longer. In both the latter and the British specimens a prominent and continuous fold occurs behind the head (separated by a sulcus); but in the Challenger form the head has a greater antero-posterior diameter, and posteriorly there are two elevated surfaces or papillæ (Pl. XLIV. fig. 3). The only difference in regard to the tail is the apparent increase in the length of the cirri towards the tip, but in this respect so much depends on the state of the preparations that little reliance can be placed on it. The tessellated dorsal regions of the respective forms are very similar.

[1] *Trans. Linn. Soc. Lond.* (Zool.), ser. 2, vol. i. p. 506, pl. lxv. figs. 15, 16.

The cirri on the posterior feet seem to be somewhat longer. The spikes on the inner edge of the forks of the bristles (Pl. XXIIa. fig. 21) are smaller, the inferior bristles showing the latter feature better than the superior. Both British and foreign bristles have unequal limbs to the fork.

The curved bodies observed in the lamellæ of the feet are probably homologous with those described by Kölliker and Greeff in *Ephesia* (*Sphærodorum*).

The intestine is distended with sandy mud, amongst which are spicules of sponges, Foraminifera, and small Gregarinæ, the latter being probably parasitic in the Annelid.

In transverse section the body-wall posteriorly agrees with the structure in *Scalibregma inflatum*, the nerve-cords lying outside the circular muscular coat, and having externally the hypoderm and cuticle. The oblique muscles meet in the middle line above the circular coat.

Eumenia, Œrsted.

Eumenia reticulata, n. sp. (Pl. XLIV. figs. 1, 2; Pl. XXIIa. fig. 20).

Habitat.—Trawled at Station 168, Queen Charlotte Sound, New Zealand, July 8, 1874; lat 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature 37°·2, surface temperature 57°·2; sea-bottom, blue mud.

The longest example is 19 mm., and about 3 mm. in diameter at its anterior wide part.

The body is elongate, inflated anteriorly, and diminishes towards the posterior extremity. The segments are about thirty-four in number.

The head is small, truncated anteriorly, and with two short tentacles at the sides, indeed, the description given by authors of other species answers very well for this form. The proboscis is extruded in all the specimens, and is subglobose. Only a single example is complete, and in this the anus shows no appendages. There are no visible branchiæ.

Fourteen of the anterior feet are sessile. In the rest the bristles are situated on slightly projecting lamellæ, somewhat like Théel's *Eumenia longisetosa*. The latter author observes that only ten of the anterior feet are devoid of lamellæ, whereas in the Challenger form it is the fifteenth bristled foot that first shows the dorsal lamella.

The condition of the specimens is adverse to minute description, since the feet are frayed and injured, but they agree closely with the above-mentioned *Eumenia longisetosa*. The forked bristles (Pl. XXIIa. fig. 20), however, differ considerably from Théel's

figure. These bifid bristles project much further from the surface than in *Scalibregma*.[1] The long simple bristles, again, are largely developed.

An evident distinction from Théel's *Eumenia longisetosa* is the arrangement of the papillæ on the dorsum, which in the new species appear to cover larger and somewhat rectangular areas (parallelograms), though the softened condition of the examples renders definition rather doubtful. It is to be recollected, however, that the characteristic papillæ are not obliterated in the softened *Scalibregma*, and therefore it is well to note the foregoing point.

On the ventral surface a series of markings (Pl. XLIV. fig. 2), somewhat hexagonal in shape, occurs along the centre, and these are joined by lines to the opaque whitish spaces between the bristle-bundles of the feet, thus producing a regular pattern. The dorsum anteriorly is irregularly reticulated by transverse rugæ and longitudinal connections; indeed, one of the specimens presented the aspect, dorsally, of *Scalibregma* without the branchiæ.

The specimens are too soft for satisfactory results after transverse section.

Family Sphærodoridæ.

The Sphærodoridæ are not included in Grube's "Gazelle" collection, nor in that from the Philippines. Schmarda gives a single doubtful form from Jamaica.

The very great depth at which the present representative was procured is interesting. The common species (*Ephesia gracilis*), however, occurred in the "Porcupine" at a depth of 664 fathoms, and again at 417 fathoms in the Norske Nordhavs-Expedition. From the latter also a new species reached 1081 fathoms.

Ephesia, H. Rathke.

Ephesia antarctica, n. sp. (Pl. XLIV. fig. 5; Pl. XXIIa. figs. 22, 23).

Habitat.—Several examples were trawled at Station 156 (near the Antarctic Circle), February 26, 1874; lat. 62° 26′ S., long. 95° 44′ E.; depth, 1975 fathoms; surface temperature, 33°·0; sea-bottom, Diatom ooze.

A species which measures about 55 mm., with a diameter at its widest part of nearly 3 mm.

The body is elongated and slightly fusiform in shape, diminishing a little anteriorly and much more posteriorly. The segments are very numerous. The head (Pl. XLIV. fig. 5) is bluntly conical, and has at each side two short and somewhat slender tentacles.

[1] H. Théel in his Annél. des. Mers de la N.-Zemble now figures (pl. iii. fig. 47) the spikes in the fork of these bristles; but he omits to add that in the proof these were absent.

The segments resemble those of the common *Ephesia gracilis*. Dorsally is the large globular appendage, which exhibits a much more minute papilla than in the latter form. Internally the globular processes have the elongated granular structures. The skin of the foot is likewise covered with many papillæ. A single spine supports the foot, the bristles in which differ from those of *Ephesia gracilis* in having the terminal piece less hooked as well as distinctly differentiated from the end of the shaft (Pl. XXIIA. figs. 22. 23). The terminal piece forms a somewhat conical process with an oblique base, the dorsal margin being slightly convex, the ventral slightly concave. The shaft is somewhat curved, and is dilated at the tip below the bevelled articular surface. The bristles are very translucent, and approach those of *Ephesia canadensis*, a species, however, which differs in other respects from this form.

Ephesia antarctica is a very large example of the genus, and yet it inhabits uncongenial waters.

The muscular intestine contains a central whitish mass of minute Diatoms and other organisms composing the ooze. The muscularity and elasticity of the alimentary canal are remarkable.

The cuticle in this form is tough and hyaline, but the hypoderm and the circular muscular coat are feebly developed. The longitudinal muscles have about the same proportional thickness as in *Ephesia gracilis*. The ventral longitudinal muscles are divided into two distinct regions by oblique fibres which pierce them in a direction from above inward and downward. In the interganglionic regions the oblique muscular fibres form a well-marked cross beneath the isolated nerve-cords, which are nearly round, with a central granular area and a pale firm investment. Towards the anterior third the proboscis fills up the entire space within the body-wall. Externally (in retraction) is a dense longitudinal coat, the fasciculi of which are somewhat radiate. A thick circular layer, the fibres of which are interwoven, follows on the inner side, then a slightly developed hypoderm, and internally a dense cuticular layer elevated into many prominent frills, each having a central axis of hypoderm.

Family Chloræmidæ.

The distribution of this family is in some respects noteworthy, both as regards area and depth. Thus most of the specimens described by former voyagers come from shallow water or between tide-marks, but the explorations of the Challenger have carried these peculiar forms to a depth of 2500 fathoms, or nearly twice the depth at which the naturalists on board the "Porcupine" had found *Trophonia glauca*, Malmgren. Moreover, the wide distribution of the remarkable intermediate type, *Buskiella abyssorum*, is interesting in connection with the view that the ancient forms have been gradually driven into the great depths by the more recent types attaining supremacy in the shallower water.

Grube describes three forms in his account of the Annelids of the "Gazelle," and one in Semper's Philippine series. Schmarda gives four littoral forms (a *Trophonia* and three species of *Siphonostomum*), while Kinberg has the same number, also from shallow water. Hansen describes no less than five new species from the Norwegian North Atlantic expedition, but none came from greater depths than 658 fathoms.

The remarkable Antarctic *Trophonia wyvillei*, from Station 157, is one of the largest and most characteristic of the group.

The representatives of the family are eagerly devoured by fishes, a feature of moment in the Arctic and Antarctic regions, where they are common.

Trophonia, Milne-Edwards.

Trophonia capensis, n. sp. (Pl. XLIV. figs. 7, 8 ; Pl. XXIIIa. figs. 1–3).

Habitat.—Found between tide-marks at Sea Point, Cape Town, December 1873.

The single specimen is moderately large, extending in length about 60 mm., and being fully 4 mm. in diameter at its widest part.

The body is slightly tapered at the snout, remains of considerable diameter for a long distance, and then gradually diminishes toward the tail. There are upwards of eighty (eighty-one or eighty-two) segments, which are somewhat quadrangular in transverse section. The skin throughout is firm and rough, the surface, indeed, resembling sand-paper, from the minute sand-grains, fragments of sponge-spicules, Foraminifera, and other siliceous and calcareous particles attached to it. These adventitious structures seem to be directly fixed to the surface of the cuticle, which is thin. The anterior third of the dorsum is most marked in this respect, that is, has the largest and coarsest grains.

The snout (Pl. XLIV. fig. 7) bears two grooved tentacles similar to those of *Trophonia plumosa*, and a dense tuft of branchiæ superiorly on each side. The latter differ from those of the common form in being more slender, more numerous, and in springing from the ventral aspect of a tongue-shaped triangular process which projects upward and forward on each side from the upper lip. Each is marked, in extrusion, on the dorsal surface by a line of dark pigment just within a pale margin. These processes appear to be united along the middle line, though a deep groove exists on the ventral surface. On the latter aspect the branchiæ are placed in close series, and in somewhat regular rows. Each contains an afferent and efferent vessel. On each side of the median line inferiorly is a small conical papilla with a dark summit, and then the bell-shaped buccal projection occurs all round. The latter is surrounded by a somewhat thin, frilled marginal fold. The whole is apparently formed for retraction, so that the branchial apparatus may be efficiently protected.

The first and second bristles are comparatively short, extending only a brief distance

beyond the branchiæ; and they resemble those of *Trophonia plumosa*, except perhaps that the transverse bars are on the whole more densely grouped in some of them (Pl. XXIIIA. fig. 1). The first three pairs of bristle tufts, both dorsally and ventrally, may be termed long. The fourth and fifth are only elongated to a certain degree ventrally. At the tenth foot the ordinary condition is well seen, viz., dorsally a short tuft of finely tapered bristles, which are more closely and more deeply marked by transverse striæ than in the common species; and ventrally a series of characteristic hooks (Pl. XXIIIA. fig. 2), which show a smooth, slightly tapered distal region with a curve at the extremity, then a shaft with about four very boldly marked transverse striæ (often the seat of fracture), which are separated by intervals generally greater than the diameter of the shaft, and sometimes twice as much. Finally, these are followed by a series of finer striæ, very closely arranged.

Posteriorly the dorsal bristles (Pl. XXIIIA. fig. 3) remain very much the same, the most complete forms showing a minute hook at the tip, as in the figure. So few, however, are uninjured that some caution is necessary in predicating from this preparation.

The posterior hooks, again, show a more slender distal region with the curves better pronounced. There are only two or three of the boldly marked transverse bars. In certain preparations both of these and the anterior hooks, fine transverse striæ are observed running upward from the base of the shaft almost to its extremity, the distal region alone being translucent.

The skin is much less prominently papillose than in *Trophonia plumosa*, the rudimentary feet (carrying the bristles) showing only a few short clavate papillæ.

Very few parasitic Infusoria appear on the frontal bristles of this species.

The specimen has a vast number of dark olive ova, partly floating freely in the perivisceral cavity, but chiefly attached to racemose ovaries covering an extensive area, and in all stages of development.

In the intestine are masses of very coarse sand-particles, a few sponge-spicules, and parasitic Gregarinæ.

It is difficult to state precisely what the relationship of Kinberg's *Piromis arenosus*,[1] from Port Natal, is to this species. It does not seem to be identical.

Trophonia kerguelarum, Grube (Pl. XLIV. figs. 9, 10; Pl. XXIIIA. figs. 4–6).

Trophonia kerguelarum, Grube, Annelidenausbeute von S.M.S. "Gazelle," Monatsber. d. k. preuss. Akad. d. Wiss. Berlin, von Aug. 1877, p. 539.

Habitat.—Numerous examples were dredged at Station 149H (off Cumberland Bay, Kerguelen), January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; surface temperature, 39°·8; sea-bottom, volcanic mud. Grube's forms were procured in Successful Bay, Kerguelen.

[1] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1866, p. 338.

The specimens seem to be considerably longer than Prof. Grube's, the larger measuring about 30 mm., with a breadth anteriorly of 4 mm. exclusive of the bristles. The segments are also more numerous.

To the general description of Grube may be appended the structure of the bristles.

The jointed superior bristles of this form show a peculiarity which has not been mentioned by the original describer, viz., that the upper part of each segment is slightly dilated superiorly (Pl. XXIIIa. fig. 4), especially toward the tip of the bristle. Hansen[1] indicates a similar condition in his *Trophonia hirsuta* from the North Atlantic.

The hooks, again, are slender at the tip, many indeed tapering to a fine point, which is pale and striated. The superior also show a slight enlargement at the commencement of the translucent extremity. The range in regard to the variation of the tip is indicated by the figures in Pl. XXIIIa. figs. 5 and 6, the former being one of the lower, the latter one of the upper forms. Some of the posterior hooks are even more pointed than in fig. 6. Parasitic Infusoria are common on these structures.

The female specimens show masses of dull brown ova anteriorly, and the male pale sperm-masses. The former are easily recognised by the coloration given to the body by the ova.

The body is somewhat sparsely covered with conical papillæ, which in some cases are so long as almost to be filiform. No sand-particles or other adventitious structures adhere to this form.

The fine mud in the intestine consisted chiefly of sponge-spicules and Diatoms.

The absence of sand-grains from the skin renders sections of this species comparatively simple. Externally is a dense layer of hyaline chitinous cuticle, which appears to be almost of uniform thickness. The same layer covers the long papillæ. The hypoderm is not much developed except at the bases of the latter, a thin granular layer occurring under the former, from which processes pass into the papillæ. The circular muscular coat is well marked, and apparently continuous. The longitudinal dorsal muscles form expanded plates extending from the upper insertions of the oblique to the dorsal median line. Their fasciculi do not show any special arrangement. The longitudinal ventral cover a smaller area, bounded internally by the oblique muscles and externally by the circular coat. The oblique are somewhat strong muscles which meet below the nerve-trunks, as in the typical form (*Trophonia plumosa*, O. F. Müller).

The nerve-cords are separate in the intervals between the ganglia.

In the anterior third the alimentary tube presents two characters, apparently from folds of both regions being included in the sections. The small firm tubes are apparently œsophageal, the inner surface being frilled by folds of the dense granular glandular lining, while externally is a thin coat of circular muscular fibres. One of these sections invariably shows two large folds projecting from the ventral curve. The larger sections pertain to the stomachal region of the gut, and have a thick lining of columnar epithelium internally.

[1] Den Norske Nordhavs-Exped., Tab. vii. fig. 8.

Grube first described this species in 1877 from specimens collected by the German exploring ship "Gazelle." No information is given in regard to its habitat.

Trophonia wyvillei, n. sp. (Pl. XLIV. fig. 6; Pl. XXIIIA. figs. 11–14; Pl. XXXVIA. figs. 5–7; Pl. XXXVIIA. fig. 1).

Habitat.—Trawled at Station 157 (midway between the most southern Station and Australia), March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; bottom temperature 32°·1, surface temperature 37°·2; sea-bottom, Diatom ooze.

The single specimen has a length of 73 mm., and a breadth at its widest part of 28 mm. The frontal bristles extend about 30 mm. from base to tip, so that the extreme length of the animal and its bristles is about 100 mm.

The shape of the body, which is of a dusky grey colour like the ooze, is broadly elliptical or somewhat fusiform, widest about the middle and tapering to each end. The truncated anterior extremity has a slight median projection, from which the purplish frilled tentacles proceed. Posteriorly the gradual narrowing gives the end the form of a blunt cone. The entire surface is covered with a dense coating of pale filiform cilia or papillæ of great length, the tips being smoothly rounded. The surface thus appears like a piece of plush or loose grey felt. The long papillæ have a central granular axis of hypoderm, and a translucent external investment of cuticle. The structures, however, are so densely coated with the organisms of the Diatom ooze which the animal inhabits, that only comparatively short portions are available for inspection. Along the entire process, from base to tip, large and small sponge-spicules, Diatoms, and fragments of Diatoms and Radiolarians, with siliceous granules of various kinds, are closely arranged. The composition of these extraneous organisms is mainly siliceous, and the addition of hydrochloric acid makes little alteration.

When spirit was first poured over the body of the animal, a slightly milky appearance was given to the liquid as it emerged from the "felt" at the sides, from the immense number of the minute organisms just alluded to. Indeed under a lens the tips of the papillæ appear to be matted together, especially on the ventral surface, from the abundance of the Diatom ooze, and individual papillæ are rendered more or less clavate from the same reason.

The oral aperture is ventral in position, the anterior margin of the frilled tentacles only being seen from the dorsum. It is surrounded by an elevated barred rim, rendered more conspicuous by the sulcus which exists at its base, and the raised bosses forming each anterior angle of the body. A brown pigment-band occurs round the oral frill. Projecting from the aperture are the very large foliaceous tentacles, which are furrowed ventrally. Each tentacle is still tinted of a brownish-purple on the dorsum, and when flat-

tened out in life on its grooved ventral surface, must have approached a circular or discoidal form, a peculiar feature in the group. The branchiæ, again, are somewhat massive, clavate organs, also tinted of a pale madder-brown hue. Only a few project beyond the tentacles in the preparation. The anus is situated ventrally a little within the posterior border.

The body has twenty-two bristle-tufts on each side, the ventral, in the case of all except the first, being stronger and much more conspicuous than the dorsal.

In the first series the bristles are nearly of equal length, dorsally and ventrally, forming a beautiful long tapering pale golden tuft, which constitutes an elegant anterior fringe to the somewhat saccate body. The bristles of the ventral division of the first series arise from the prominent angles of the truncated anterior extremity, and their flattened shafts are ranged in a slight curve, with the convexity directed ventrally, and slanting from above downward and outward, while their slender tips form a fan-shaped fringe anteriorly. The first dorsal are represented by a series of broken stumps, situated a little behind the anterior margin of the body, on each side of the middle line, and running transversely outward beyond the upper series of the ventral bristles. They are pale golden bristles with a series of closely arranged transverse striæ, which become further apart towards the tip, as usual in allied forms (Pl. XXIIIA. fig. 11). They are also marked by fine longitudinal lines, and their tissue is somewhat brittle, the fractures, moreover, sometimes presenting a laminated appearance. While the transverse striæ become considerably wider toward the tip (Pl. XXIIIA. fig. 12), they again approach each other at the extremity of the bristle. The curvature of these long bristles is very evident towards the tip, and is indicated even in the minute portion represented in the last mentioned figure.

The second bristle-tufts conform more closely to the type present throughout the rest of the body, presenting dorsally a series of long glistening golden bristles, which are only a little shorter than those of the first series, and aid the former in the construction of the frontal fan, while touching the ventral series by their under border. They agree in minute structure with the first series, only they are somewhat less. In the ventral division, again, the bristles are proportionally shorter and thicker, with delicately tapered tips, and resembling that figured in Pl. XXIIIA. fig. 13.

The bristles of the third series are also longer than the others, both dorsally and ventrally, but nothing specially noteworthy exists in their structure.

After the third the dorsal bristles become very slender and comparatively short, being scarcely distinguishable at first sight amongst the papillæ of the lateral region. So closely are they placed near the ventral bristles that they appear to be lateral or even ventral in position. They correspond in structure to the frontal, only being more slender and delicate. The striæ are closely arranged at the base, widely separated toward the tip.

The ventral bristles have a golden hue, are flattened, have a slightly curved shaft and a delicately tapered tip (Pl. XXIIIA. fig. 13). With the exception of the latter, the

whole organ is striated transversely. When more highly magnified (Pl. XXIIIA. fig. 14) the striæ are observed to become oblique in direction just below the pale terminal region. As a rule the inferior bristles are the shorter, and there is not much difference in size between those of the fifth tuft and the last. When the Annelid is placed on its dorsum, both these and the dorsal bristles are included in what appears to be the ventral area, but of course the flaccidity of the body causes some exceptional features in this respect.

The oral aperture is in the form of a considerable anterior slit, having dorsally six madder-brown branchiæ with pale tips, arranged along the dorsal arch of the aperture. Ventrally are the two great foliaceous lamellar tentacles with a deep inferior groove. Two parasitic forms (*Trophoniphila bradii*, n. sp.[1]) adhered to the bases of the branchiæ, their smooth yellowish bodies (ovisacs) projecting into the mouth, while the anterior end was imbedded in the tissues. In shape each is somewhat fusiform or elongate-ovoid (Pl. XXXVIA. fig. 4), the anterior end being more pointed than the posterior, indeed, in some views the aspect is slightly clavate. One had a brownish globular anterior region with two papillæ and a process which was attached to the base of the branchia. The other had only a brownish mucronate surface. The chitinous body formed a chamber for the reception of the eggs. Levinsen[2] describes a species in *Brada villosa*, H. Rathke, but this has a much larger anterior region, which is also reflexed. There are also two ovisacs, which are attached a short distance in front of the posterior end. It thus differs considerably from *Trophoniphila*, which indeed is nearer the larval form of Levinsen's species.

The œsophagus (Pl. XXXVIA. fig. 5, *a*) is somewhat dusky anteriorly, passes backward with a curve to the left, and is continuous with the stomachal region, though there is no definite boundary-line. The intestine is remarkably elongated, probably nearly four times the length of the animal, an unusual feature in the Annelids. The greater part of this is formed by the anterior or smaller gut (Pl. XXXVIA. fig. 5, *b*, *b'*), the large intestine (*d*) being rather shorter. The junction between the two parts is marked by a somewhat constricted region in the anterior gut, which is thus boldly defined from the larger intestine. A slight diminution (*e*) again occurs a little in front of the anus (*f*).

The foregoing alimentary canal is coiled in a complex manner in the perivisceral chamber, and from the margin of the canal a mesentery (*c*, *c'*) composed of a beautiful network of blood-vessels passes off. These blood-vessels are of considerable size, and must perform important functions. They seem to be more slender at their junction with the canal immediately behind the attachment of the fimbriated termination of the proboscis. A little further backward, again, they form remarkably flattened expansions, so that the apertures in the meshwork are less than the tubular parts. Under a lens the edges of these fine vascular twigs are studded with minute processes like microscopic beads,

[1] After Prof. G. S. Brady, of Durham University, author of many valuable memoirs on the Ostracoda and Copepoda.
[2] *Vidensk. Meddel. f. d. nat. Foren. i Kjøbenhavn*, 1877, p. 371, woodcuts C–E.

which under a moderate power (Pl. XXXVIA. fig. 6) show externally a translucent investment of connective tissue, and internally a highly refractive globular body often split into two or more divisions, and resembling a fatty mass. A distinct capsule surrounds the refractive body. The abundance of these on the vessels indicates their functional value. The walls of the vessels are further provided with granular cells and granules frequently arranged in longitudinal masses like glands. The whole structure appears to unite in providing for the lymphatic and circulatory functions. Certain parts of the narrow anterior region of the alimentary canal also present a somewhat reticulated appearance, probably from the arrangement of the glands in the wall.

From the dorsal region of the buccal chamber the proboscidian sheath, a tube externally somewhat resembling the former, proceeds backward to be attached to the alimentary canal about its anterior third. This tube did not appear to have any communication with the canal, but the tissues were so soft that the slightest interference caused rupture, and thus several points escaped notice. Externally this tube is of a dark madder-brown colour, and curiously ridged longitudinally, the free edges of the ridges being fimbriated. So far as could be made out in the softened specimen, the apparatus terminated posteriorly by becoming attached to the wall of the alimentary canal, after a course of about an inch and a half, the terminal ridge being provided with a number of long fimbriæ (Pl. XXXVIA. fig. 7). Internally are two slender white processes, which probably represent the proboscis. In section the external sheath presents a hyaline layer, apparently structureless, though generally marked by transverse wrinkles. Immediately within is a thick stratum of rounded cells and granules, bounded internally by another hyaline coat similar to the former. The rounded cells are slightly coherent, and contain brownish pigment. The central area is occupied by masses of granules and sections of the slender whitish tubes. The latter have a firm external layer and a granular central region.

The minute structure of the œsophagus differs quite from the foregoing. Externally is a coat composed chiefly of longitudinal fibres, followed by a firm circular muscular layer, which adjoins the lining of cylindrical epithelium. The latter consists of long fibre-like granular cells defined internally by a granular limiting membrane. This region of the canal also possesses the mesenteric vessels with the large refractive bodies in their walls.

The whole alimentary canal was filled with a whitish pulp consisting of a vast variety of Diatoms and their debris and a considerable number of Foraminifera, chiefly *Globigerinæ*. The great length of the alimentary canal is peculiar, and cannot altogether be associated with a diet mainly composed of vegetable organisms (Diatoms), for the system is no longer in the phytivorous than in the carnivorous Eunicidæ and Nereidæ.

Below the œsophageal region anteriorly is a series of transverse glandular processes, three or four in number and symmetrically arranged, which probably represent the reproductive organs. The upper surface of these organs is papillose, and they are

connected by a duct (? vessel) with the buccal region. The vessel bifurcates just behind the latter region, the right branch joining a cylindrical firm glandular organ closely applied to the gullet, the left passing round the latter toward the dorsal region. The cylindrical glandular organ formerly mentioned is joined a little in front of its posterior border by another U-shaped glandular body of much larger size, but apparently of the same structure. One leg of the U is fixed to the former organ, the other is attached to the œsophagus.

The united nerve-cords lie between the ventral longitudinal muscles, and are internal, that is, they are bathed by the perivisceral fluid. The ganglia and their lateral branches are well marked, and are situated nearly opposite the bristle-bundles.

The body-wall is composed of a hyaline, slightly areolar, cuticular coat of great thickness (Pl. XXXVIIA. fig. 1), to the external surface of which the long slender papillæ are attached. The best developed of these organs are from eight to ten times longer than the whole thickness of the body-wall, and each papilla only diminishes very slightly toward the tip. The whole surface, as already mentioned, however, is obscured with fine Diatom ooze, which also binds several adjacent papillæ into a mass. A hypodermic process passes through the translucent cuticle at the base and goes almost to the extremity of the papilla. The basal part of this hypodermic axis is dilated at its origin. The hypoderm is comparatively thin, and the same may be said of the circular muscular coat. A nearly continuous layer of longitudinal fibres (homologous with the dorsal longitudinal muscles) envelops the body-wall within the former, and gives a glistening aspect to the inner surface. The two ventral longitudinal muscles form narrow flattened ribbands on each side of the nerve-cord.

In several respects, such as the great size, the condition of the skin, the paucity of the branchiæ, and the internal anatomy, this form presents diagnostic features. The *Stylarioides parmatus* of Grube,[1] from the Philippines, somewhat resembles it in outline, but diverges much in regard to the branchiæ and the nature of the ventral bristles. The anatomy of this Philippine Annelid is not given.

Brada, Stimpson.

Brada mammillata, Grube (Pl. XLIII. fig. 11; Pl. XXIIIA. figs. 7, 8).

Brada mammillata, Grube, Jahrb. d. Schles. Gesellsch. für 1876, Bericht d. Naturwiss. sep.) Abd.), p. 40.

Habitat.—Dredged somewhat plentifully at various points off Kerguelen, *e.g.*, Station 149 (Accessible Bay), January 9, 1874; lat 49° 8′ S., long. 70° 12′ E.; depth, 20 fathoms; sea-bottom, volcanic mud. Station 149A (Betsy Cove), January 14, 1874; lat. 49° 8′ S., long. 70° 9′ E.; depth, 40 fathoms; sea-bottom, volcanic mud.

[1] Annelidenfauna d. Philippinen, p. 199, Taf. xi. fig. 1.

Station 149B (off Royal Sound), January 17, 1874; lat. 49° 28′ S., long. 70° 30′ E.; depth, 25 fathoms; surface temperature, 40°·5; sea-bottom, volcanic mud.

The skin is coated with minute grains of sand.

The frontal bristles (Pl. XXIIIA. fig. 7) have, on the whole, somewhat narrow bars, except at the tip, and are remarkable for the great profusion of stalked parasitic Infusoria which embellish them. So dense is this infusorial coating that the bristles form a matted mass in which Nematoids and other forms lodge. The condition of such bristles resembles the stem of a zoophyte clothed with *Clytia johnstoni* and other Campanularians. The bell-shaped Infusorians are in various phases, that on the right of the figure (with the parasitic vase on its stalk) has ruptured, and only the nucleus and a little granular matter remain.

The dorsal bristles are pale, comparatively small and slender, and marked by closely arranged transverse striæ.

The ventral "hooks" are nearly straight or slightly curved dull reddish-brown structures, very closely marked with transverse striæ (Pl. XXIIIA. fig. 8), which superiorly often form groups, with an interval between them. The ventral margin of the tip is often slightly abraded.

The intestines of those from Betsy Cove are loaded with ooze, containing large circular Diatoms, numerous and varied sponge-spicules, and other structures.

The description given by Grube in the account of the Annelids of the German exploring ship "Gazelle" seems to agree with the foregoing. In his remarks on the anatomy of this species Studer[1] speaks of the splitting of the circular muscular coat at the bristle-bundles, and this feature is well shown in the forms procured by the Challenger. He describes, however, the longitudinal layers as arranged in separate pennate processes which project inward from the circular coat. Though the dorsal and ventral longitudinal muscles are cut into isolated fasciculi of a flattened form by bands of fibres, no tendency to a pennate arrangement is noticeable. The oblique muscles are strong and decussate under the nerve trunks, their fibres mixing with those of the circular muscular coat. The structure of the body-wall is on the whole typical. Studer describes four pairs of genital sacs symmetrically arranged anteriorly on the ventral surface.

Studer's specimens came from Betsy Cove, Kerguelen, in 5 to 10 fathoms.

Brada whiteavesii,[2] n. sp. (Pl. XLV. figs. 3, 4; Pl. XXIIIA. figs. 9, 10).

Habitat.—Dredged in Queen Charlotte Sound, in 10 fathoms.

[1] *Archiv f. Naturgesch.*, 1878, p. 113, Taf. v. figs. 1–10.

[2] Named after Mr. Whiteaves, who first brought it under my notice during his dredging expeditions in the Gulf of St. Lawrence.

The length of the specimen is 18 mm., and the breadth at its widest part in front nearly 4 mm.

The body is somewhat fusiform, tapering toward either extremity, but more especially toward the posterior. It is less convex ventrally than dorsally. The skin is densely covered with long acute papillæ, which in the Challenger specimen are coated with fine sand, so that the body has a very different appearance from that in which the papillæ are bare. The segment-junctions are devoid of these papillæ, and thus are very clearly marked. The ventral surface is studded with smaller papillæ of the same kind. Twenty-two segments are present in the specimen, which is incomplete.

The snout is bluntly rounded, and the tentacles and branchiæ are retracted. The oral region is indicated by a triradiate slit.

The anterior bristles are slender and comparatively short, of a pale golden hue and highly lustrous, as usual in the group (Pl. XXIIIA. fig. 9). So far as can be observed, their transverse bars are tolerably wide. The dorsal bristles, again, are moderately elongate, and have a similar structure to the foregoing.

The ventral hooks are rather elongate, with pale tapering filiform tips, and a series of somewhat close striæ (Pl. XXIIIA. fig. 10). In many of the posterior hooks the tips are even more filiform. They resemble in this respect the condition observed in *Trophonia rugosa* and *Trophonia arctica*, Hansen.[1]

The papillæ of the feet are elongate, almost filiform processes, having an external cuticular investment and an internal axis, ending in an expanded basal region, composed of hypoderm.

In transverse section the great thickness of the cuticle is noteworthy, and it is densely covered with minute sand-grains, which likewise envelop the slender papillæ, so that, as a rule, little more than the tips of the longest are free. The hypoderm is comparatively thin, except at the base of the papillæ. The circular and longitudinal muscular layers are also thin, a feature probably in relation to the great thickness of the cuticular coat.

This Annelid does not appear to correspond with any of the American forms described by Stimpson or Verrill.

Buskiella,[2] n. gen.

Buskiella abyssorum, n. sp. (Pl. XLV. figs. 1, 2; Pl. XXIIIA. figs. 15–18).

Habitat.—Fragments of this remarkable form were trawled at the following Stations:—

Station 101 (off Sierra Leone, on the African Coast), August 19, 1873; lat. 5° 48′ N., long. 14° 20′ W.; depth, 2500 fathoms; bottom temperature 36°·4, surface temperature 79°·2; sea-bottom, blue mud.

[1] *Op. cit.*, pp. 38 and 39, Tab. vii. figs. 12 and 20.

[2] Named after G. Busk, Esq., F.R.S., one of the most devoted and most exact of living zoologists.

Station 106 (about midway in the Atlantic between the former and the American coast), August 25, 1873; lat. 1° 47′ N., long. 24° 26′ W.; depth, 1850 fathoms; bottom temperature 36°·6, surface temperature 78°·8; sea-bottom, Globigerina ooze.

Station 333 (to the west of Tristan da Cunha, on the return voyage), March 13, 1876; lat. 35° 36′ S., long. 21° 12′ W.; depth, 2025 fathoms; bottom temperature 35°·3, surface temperature 67°·0; sea-bottom, Globigerina ooze.

All the specimens are fragmentary, but it is clear that the type is peculiar and apparently intermediate between the Chloræmidæ and Chætopteridæ. The size of the species seems to be considerable, some of the fragments measuring about 90 mm. in length, and with a breadth, exclusive of the bristles, of 5 mm. The long bristle-tufts extend outward about 18 mm.

The body is enveloped in a hyaline and gelatinous-like cuticle, which gives the animal a resemblance to *Flabelligera*. The contingencies connected with its capture from so profound an abyss as 2500 fathoms necessarily and largely affect its soft tissues.

The snout is formed by the dark brownish muscular tip, which has its convexity directed ventrally and its concavity dorsally. It forms, indeed, a horse-shoe-like projection, the upper and posterior angles running into a double foliaceous and somewhat frilled brownish mass which constitutes the superior boundary of the oral aperture. Close behind the latter is a stout process, bearing a long median filament which has an enlargement at the tip, and two lateral processes considerably shorter, and with filiform extremities.

A little behind the snout are a pair of lateral enlargements supporting the long delicate bristles which have a sheen like spun glass. They are peculiarly delicate, transparent, large, flattened bristles with long articulations (Pl. XXIIIA. fig. 17), which are quite visible under a lens; indeed, a group of them somewhat resemble the cartilages of a delicate fin-ray. They are flexible bristles of simple structure, presenting only very fine parallel longitudinal striæ (Pl. XXIIIA. fig. 16) in their otherwise structureless segments. The transverse articulations are very distinctly marked. The basal region (toward the insertion) of each bristle is somewhat narrowed and slightly granular. Distally the segments become shorter, and the bristle terminates in a pointed tip (Pl. XXIIIA. fig. 15). Some of them show a less acute extremity, probably from injury and recent repair.

The ventral bristles, again, seem to be represented by an equally translucent series of simple straight forms which taper to a fine point (Pl. XXIIIA. fig. 18). They are very much shorter than the dorsal, with which they cannot be confounded. No transverse bar or articulation is visible, but under a high power similar very fine parallel longitudinal striæ occur. Their tips often attain an exceedingly attenuated condition, but it is rare to find one entire, for they adhere by a roughened region near the extremity to the cutaneous tissues and break very readily. The very fine tip is absent in the figure (fig. 18).

The hyaline cuticle invests the body with an almost gelatinous coating. It is abundantly studded with granules, and numerous elongated glands, which are filled with minute cells and granules. The glands probably furnish a secretion, as in others of the group.

The muscular body-wall beneath the latter is tinted of a brownish hue.

The mouth leads into a dark brownish thickly walled pharynx, which in the preparation is somewhat moniliform. The latter terminates in a firm, white, and nearly cylindrical region, somewhat narrowed posteriorly, where it merges into a longitudinally furrowed glandular part continuous with the intestinal canal. The latter shows by and by a change in colour.

The nervous system (Pl. XLV. fig. 2) is beautifully shown on the ventral surface as a double cord, with two ganglia placed antero-posteriorly in each segment, the larger being in front and the smaller behind.

The condition of the specimens is unfortunately unfavourable for the examination of their minute anatomy, so that this must for the present be postponed. Sufficient was seen, however, to indicate that this will prove a most interesting and productive inquiry.

It is remarkable to find this peculiar type stretching over so vast an area in mid-ocean, and at such a depth.

Family Chætopteridæ.

Representatives of this family are present in most collections, though none occur in the Philippine series of Prof. Grube. The latter mentions two in his account of the Annelids of the "Gazelle"; while Kinberg and Schmarda each describe the same number. It is noteworthy that no example comes from the Strait of Magellan, from which two species have already been procured, in addition to an undescribed ringed tube in the British Museum from the same locality.

Both forms found by the Challenger come from comparatively shallow water, for little weight can at present be placed on the empty tubes dredged in deep water off the American coast. *Spiochætopterus typicus* of Sars, however, was obtained at a depth of 557 fathoms in the "Porcupine," and there is no reason why this and others should not descend to a much greater depth.

The distribution of the family is extensive, since it ranges from the extreme north to the extreme south.

Phyllochætopterus, Grube.

Phyllochætopterus claparedii, n. sp. (Pl. XLV. figs. 9, 10, 10*a*, 11; Pl. XLVI. fig. 1; Pl. XXIVa. figs. 1–5).

Habitat.—Dredged in considerable abundance from the two following Stations:—

Station 233 (off Kobé, Japan), May 17, 1875; lat. 34° 39′ N., long. 135° 14′ E.; depth, 8 fathoms; surface temperature, 62°·3; sea-bottom, mud.

Station 233A, January 19, 1875; lat. 34° 38′ N., long. 135° 1′ E.; depth, 50 fathoms; surface temperature, 62°·6; sea-bottom, sand.

When removed from its tube the body of the animal presents anteriorly (Pl. XLVI. fig. 1) an enlarged truncate snout, grooved on the dorsal and somewhat truncate on the ventral surface. The anterior margin has the form of the equine hoof, the hollow looking upward, and marked just within the rim by a brownish band. Dorsally the elongated tentacles arise behind the sides of the hoof, and stretch outward to a very great length, some of the organs in the spirit-preparation measuring 50 or 60 mm., and of course being capable of much greater extension in life. A very distinct double madder-brown band runs along the ventral margin of each organ (probably in the groove) from base to tip, and must increase the beauty of the mobile structures in activity. They are slightly narrowed at the base, and still more toward the tip. A little above the insertion of each is a short clavate tentacle.

As in the latter species the first region of the body includes, besides the snout, nine segments. It is somewhat concave on the dorsal, convex on the ventral surface. An elevated central fillet with a double brown band occurs on the dorsal surface, while the ventral is variegated by pale brownish pigment in front, and, as in *Spiochætopterus typicus* by a large pure white shield-shaped patch, stretching from the sixth to the ninth bristle-bundle, and covering the sides as well as the ventral surface proper. The contrast is further intensified by a broad blackish or dark olive belt immediately in front. The white pigment is peculiarly pure and effective, resembling a dense coat of Chinese white. In some specimens a faint belt of a delicate fawn colour surrounds the shield.

In general structure the bristles of this region correspond with those of *Spiochætopterus typicus*. The first three feet have dorsal pads, bearing rows of bristles just within the margin. The first series consists of bristles with tips formed of expanded wings, somewhat halbert-shaped (Pl. XXIVA. fig. 1) in profile, and spear-shaped (fig. 2) when viewed antero-posteriorly, though it is rare to get a perfectly symmetrical outline. At the third series the extremities are widened, and the fourth are still more robust both in shaft and tip. Moreover, in the middle of the series are one or two of the strong brown spines (Pl. XXIVA. fig. 3), which when seen by transmitted light, as in the figure, presents no distant resemblance to the structure of certain dental tissues. Each is a hard, brittle, hollow organ with a broad bevelled tip (slightly scooped out) like the crown of a worn tooth, and a little pressure splits it longitudinally into halves. The bristles of the fifth series, again, have stouter shafts and broader tips (Pl. XXIVA. fig. 4), and are altogether larger, as indicated by the proportions of the drawing just mentioned in contrast with figs. 1 and 2.

The middle region of the body consists of two segments, which appear to agree in structure with those of the typical form.

The posterior division has very fine slender bristles with much smaller tips than in the first (Pl. XXIVA. fig. 5). The whole region resembles that of the European form, presenting dorsally the long bristles, which retain the characters represented in the figure, and ventrally the soft pads. The bristle-bearing processes have the same clavate tips as in *Spiochætopterus typicus*.

The extreme transparency of the minute hooks on the lateral processes renders their detection difficult, and the serrations on the anterior margin are almost invisible. In shape these hooks resemble those of *Phyllochætopterus socialis* represented by Claparède, though the figure appears to be inverted.

The tubes of this species range from fragments up to 280 or even 380 mm. in length, with a diameter of about 2·5 mm. They are for the most part semiopaline or semi-translucent, and often ringed for considerable distances, *e.g.*, 2 or 3 inches. Some are slightly tinted of a brownish-yellow. Though somewhat brittle they are very elastic, and particles of mud are sent flying considerable distances in tearing the tube, or in other manipulations. So very few of the tubes are perfect that the precise condition of the anterior aperture is uncertain, but it would seem to be slightly everted. Toward the posterior end, again, a very neat diaphragm (Pl. XLV. fig. 10*a*) with a minute aperture in the centre occurs; and above the septum is occasionally a collection of the small ovoid fæcal masses and other debris, so that this region of the tube is rendered opaque.

Many of the tubes are forked, an appearance which is due to the fracture of the tube, and the continuation of the latter, not by the union of the broken ends, but by the secretion of a new piece with which the old tunnel is continuous; while the broken fragment has its channel closed, and it remains adherent apparently as a useless process. This seems to occur both anteriorly and posteriorly, as tubes are found with a diaphragm in each limb of the fork. The bifurcation is thus only apparent, not actual. A few of the tubes show a series of such regenerations, so as to resemble the polypary of a Sertularian.

Structurally the tube is composed of the usual chitinous secretion. Immersion for some hours in caustic potash causes it to shorten and enlarge, as well as to become more opaque and brownish, while similar treatment with hydrochloric acid renders it rather more translucent and softer (the tube being flattened), but does not disorganise it, for its toughness is little altered. Ordinary chemicals, indeed, have comparatively slight effect on it.

Few parasitic structures are attached externally to the tubes. In one instance an Ascidian with a translucent papillose test was fixed to two adjacent tubes; and amongst a group of small yellowish ova were several sand-tubes containing an amphipodous Crustacean, after the manner of the British *Siphonœcetus typicus*, sp. Bate.

Besides the rightful owner of the tube, a commensalistic form, *Polynoë ocellata*, is present in considerable numbers. As a rule, the *Phyllochætopterus* could not be obtained

otherwise than in fragments, and these often quite pulpy. The spirit does not seem to gain access to the middle and posterior parts of the tube, so as to counteract the softening of the animal in its own fluids or sea-water. Not more than a single *Phyllochætopterus* existed in any tube, but occasionally two examples of the *Polynoë* were found, either together, or one in front and another behind. In the latter case, however, no diaphragm was present, so that the second specimen may have entered accidentally. The *Polynoë* keeps the entrance to the tube, just in front of the tentacles, its own palpi often projecting from the aperture. In order to thrust out its tentacles the *Phyllochætopterus* must therefore glide past the *Polynoë*, the narrow, flattened body of which is specially adapted for its peculiar habitat. The Polynoidæ are remarkable for the frequency with which they haunt the tubes of Annelids as well as other organisms.

The intestinal pellets consist of a fine greyish mud rich in Diatoms, sponge-spicules, fragments of Radiolarians, and many other minute structures.

The cuticle in transverse section of the anterior third (Pl. XXXVIA. fig. 3) is only seen here and there as a firm clear margin to the hypoderm. Its development, therefore, is slight, and, indeed, it is doubtful whether it could be removed as a separate layer. The condition of the preparations (to which the spirit had gained a too tardy access in the tubes), however, is unfavourable for decision in this respect. No feature, on the other hand, is more pronounced than the great prominence of the hypoderm, which forms a dense layer, almost a third of the whole thickness of the body, on the ventral surface. The long cells are arranged in parallel rows, and the coat thus readily splits in that direction. It is coloured pure white. The hypoderm, while much thinner than on the former region, forms a considerable layer laterally and again on the dorsum, where a thickened ridge occurs on each side of the median line. The ovoid nerve-cords are widely separated, but they are of large size. They occupy a hollow below and internal to the homologues of the longitudinal ventral muscles, and have ventrally the dense layer of white hypoderm, while externally and superiorly is the pale lateral hypoderm, also of considerable depth. A thin but continuous circular muscular layer lies beneath the latter coat. The longitudinal dorsal muscles form a triangular area on each side of the upper part of the alimentary region, the superior fibres forming an arch over it and closely approaching each other in the middle line, while the inferior apparently become continuous with the longitudinal muscular coat of the alimentary sheath. As in the common *Chætopterus* of Britain, many vertical muscular bands pass through the chief mass of the longitudinal dorsal, and in the preparations these bound numerous spaces, which, however, may partly be due to rupture after immersion in spirit. The condition is diagnostic when compared with the common form just mentioned. The vertical fibres pass at intervals to join the circular coat ventrally at a point internal to the nerve-trunk. The comparatively small longitudinal

ventral muscles are lateral in position, passing from the dorsal angle to the nerve-trunk on each side.

The ventral wall is formed by the circular coat formerly mentioned, and a thin lining of longitudinal fibres. This slender region is, however, supported externally by the massive white hypoderm.

The meshes above the ventral wall contain large clear yellowish masses resembling oil.

Within the longitudinal layer of the alimentary sheath is a thin circular coat. The whole thickness of the wall of the canal is occupied by well-marked granular glands, with the exception of the limiting membrane internally and the thin boundary externally. Inferiorly the sheath gives off a loop to the ventral wall enclosing the clear yellowish substance and superiorly a vessel.

In the posterior region the body is less flattened. The ventral hypoderm, though still forming a dense layer, is considerably thinner than in front. The rounded nerve-cords have moved inward, and occupy the angle on each side of the median depression. The ventral longitudinal muscles are proportionally larger than in front, and have followed the nerve-cords inward, a median band of longitudinal fibres forming an isthmus between them. The large alimentary tract occupies most of the body-cavity.

When a transverse section of a tentacle is made the wall of the organ is formed of external circular and internal longitudinal fibres, the whole invested by a layer of hypoderm with only a definite boundary-line to represent cuticle. The inner surface of this hypoderm is greatly thickened, and contains reddish-brown pigment and peculiar granular bodies. The pigment occurs in the median fold and adjoining grooves. This region is evidently the active portion of the organ, as in the tentacles of various members of the Spionidæ, such as *Polydora*. The general structure of the appendage corresponded with that shown by Claparède in *Telepsavus costarum*.[1]

Examples of *Phyllochætopterus* are not uncommon in the Mediterranean, and at least one of the species extends to Madeira.[2]

Ranzania, Claparède.

Ranzania (?) *capensis*, n. sp. (Pl. XXIIIA. figs. 19, 20).

Habitat.—Dredged at Station 141 (Cape of Good Hope), December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms; bottom temperature 49°·5, surface temperature 65°·5; sea-bottom, green sand.

This species inhabits a small tube composed of secretion coated with *Globigerinæ*, sand-grains, and minute particles of various kinds. None of the fragments exceed 20 mm. in

[1] Annélides sédentaires, p. 23, pl. xiii. fig. 9.

[2] Langerhans, *Nova Acta Acad. Cæs. Leop.*, Bd. xlii. No. 3, p. 114.

length, and the diameter is about 1 mm. The specimen is too incomplete for representation. Along with it were several other Annelids, besides fishes and Crustacea, so that the ground seems to have been rich.

The anterior region of the body agrees with that in the ordinary form in having nine segments. The first three bristle-rows differ from those of *Phyllochætopterus claperedii* in having shorter bristles with much more expanded terminal regions. They begin dorsally by a few with narrower tips, the latter gradually increasing in breadth, as well as becoming more decidedly asymmetrical as we proceed downward. The fourth segment shows a series of elongated stoutish bristles culminating in the strong ones, and presenting the single great spine (sometimes tooth-like) as in other species (Pl. XXIIIa. fig. 19). The tips of the latter organs are bevelled and shouldered. In this foot there are also the usual varieties of winged bristles, some with very broad extremities (Pl. XXIIIa. fig. 20).

The snout of the form is asymmetrical, apparently from injury, the usual horse-shoe shaped anterior process being cleft in the middle line ventrally, and having only a comparatively small process on the left, instead of the broad frill present on the right side. A considerable central protuberance exists dorsally with a smaller papilla at each side, the latter probably representing the processes at the base of the tentacles in the ordinary form.

The first segment of the middle region of the body presents laterally a ventral pad, with a long dorsal papilla, somewhat enlarged at the tip, superiorly. It thus differs from the wing of *Spiochætopterus typicus*.

Little can be said concerning the rest of the animal, except that the long clavate dorsal papillæ occur as in the ordinary form in the posterior division. They are supported internally by very fine simple bristles, the acute tips of which slightly project externally.

The apparently abnormal condition of the snout of this specimen renders the diagnosis of its exact position uncertain, but, so far as can be observed, it comes nearest *Ranzania*. None of the posterior hooks were visible. The *Ranzania sagittaria* of Claparède was discovered by him in the Bay of Naples, living, as in the present case, in tubes composed of grains of sand. The absence of the long tentacles characteristic of the allied genera is a striking feature.

Spiochætopterus, Sars.

Spiochætopterus?

Habitat.—The only other representatives of the group are certain yellowish hyaline tubes dredged at Station 45 (off the coast of New York), May 3, 1873; lat. 38° 34′ N.

long. 72° 10′ W.; at a depth of 1240 fathoms; bottom temperature, 37°·2; sea-bottom, blue mud. The tubes, which probably represent those of a *Spiochætopterus*, are empty.

Family Spionidæ.

The Spionidæ as a rule are more abundant in the littoral region than in deep water, and thus their paucity in the present collection may be explained. In the "Porcupine" expedition, however, the common *Nerine foliosa*, Sars, reached a depth of 725 fathoms, and *Scolecolepis cirrata*, Sars, 584 fathoms; yet the former is one of the most abundant between tide-marks, while the latter chiefly comes from water of some depth off the British shores.

Kinberg mentions two from shallow water, and Schmarda four, two from the laminarian region and two from the Atlantic. Grube does not describe any in the collection made by the "Gazelle," and only one (*Polydora*) in Semper's Philippine series.

They range from the extreme north to the extreme south, one of the most widely distributed being *Polydora*, a genus which bores in rocks of various kinds, or forms tunnels in *Melobesia* as at St. Paul's Rocks.

Scolecolepis, Blainville.

Scolecolepis cirrata, Sars, var.

Habitat.—Dredged at Station 149G (off London River, Kerguelen), January 29, 1874; lat. 48° 50′ S., long. 69° 18′ E.; depth, 110 fathoms; surface temperature, 40°·2; sea-bottom, volcanic mud.

The specimen is of comparatively large size, agreeing in this respect with the same variety dredged in the Gulf of St. Lawrence by Mr. Whiteaves. The example is fragmentary, the head injured, and apparently in process of reproduction, so that an accurate investigation cannot at present be made. Anteriorly the diameter of the body is about 4 mm. The eyes are less than in *Scolecolepis cirrata*. No tentacle is present.

In general appearance and in the structure of the bristles and hooks it agrees with *Scolecolepis cirrata*, though the colour of the bristles is golden yellow, and the hooks show a shorter main fang than in the common species.

The structure of the body-wall conforms to that observed in British examples of the species, though the greater size renders certain characters more distinct. Thus the cuticle is comparatively thin while the hypoderm is largely developed, the deepest region occurring in the ventral median line at the nerve-area. The latter shows two large neural canals, separated only by a narrow median band of fibres, passing from the base-

ment tissue to which the oblique muscles are attached to the surface. The linear fibrillæ of the longitudinal muscles in transverse section constitute a prominent feature.

This species was dredged by Prof. Verrill[1] in 29 fathoms, off Block Island, and in Vineyard Sound, as well as off St. George's Bank, in 150 fathoms. The range is thus very considerable.

Scolecolepis cirrata, Sars, var. 2 (Pl. XLV. figs. 5, 6; Pl. XXIVA. fig. 6).

Habitat.—Dredged off Sombrero and St. Thomas, West Indies, in 470 and 390 fathoms.

The fragment, unfortunately, is not in good condition, so that the description is imperfect. The specimen seems to be about the average size of the European *Scolecolepis cirrata*. The diameter anteriorly is about 2 mm.

The head somewhat resembles that of the form just mentioned, but the median ridge shows no tentacles, and there is no trace of eyes. The anterior feet perhaps have more ample foliaceous appendages and smaller branchiæ. The state of the body posteriorly is such that accuracy in description is impossible. However, it is evident that instead of the row of hooks observed near the fiftieth foot in *Scolecolepis cirrata*, there are only about two (Pl. XXIVA. fig. 6) in this form. The main fang of the hook is shorter than in the ordinary European examples of *Scolecolepis cirrata*.

In minute structure the body-wall of this specimen, though presenting certain variations, does not materially differ from that of *Scolecolepis cirrata*. The nerve-cords are unusually distinct and large, and there is considerable thickening of the cuticle in the median ventral area.

Prionospio, Malmgren.

Prionospio capensis, n. sp. (Pl. XLV. fig. 7; Pl. XXIVA. figs. 7, 8).

Habitat.—Dredged at Station 141 (off the Cape of Good Hope), December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms; bottom temperature 49°·5, surface temperature 66°·5; sea-bottom, green sand.

A fragment of the anterior region, measuring about 10 mm. in length, and with a total breadth, at its widest part in front, of 1·5 mm.

The specimen is injured. The snout is proportionally larger than in *Prionospio steenstrupi*, but the somewhat button-shaped appearance ventrally may be due to softening. The branchiæ of the first foot are considerably larger than those of the fourth, and furnished at the tip with two processes (Pl. XLV. fig. 7), a smooth filiform

[1] Report of U.S. Commissioners of Fish and Fisheries, 1873.

appendage, and a crenate shorter one. The smooth branchial processes (second and third) are absent.

The feet differ in shape from those of the species mentioned. Thus at the fourth the outline of the superior lamella is more convex externally, and the inferior lamella is smaller. The bristles are also considerably shorter and stouter, both dorsally and ventrally, in the new form. The differences become more pronounced at the tenth foot, in which the long ventral bristles are much more delicate than those of the dorsal division, and the lamella of the setigerous region is less prominent. In the Challenger form, moreover, the tenth foot has hooks, whereas none occur in that of *Prionospio steenstrupi*. The shorter and stiffer dorsal bristles are also characteristic.

In regard to the minute structure of the hooks of the new species it is found that there are several denticulations above the great fang (Pl. XXIVA. figs. 7, 8), the smaller hooks, perhaps, showing these structures somewhat better than the larger, as they are more readily seen in profile.

The structure of the body-wall is nearly the same as in *Prionospio steenstrupi*, though the longitudinal dorsal muscles form a thinner layer on each side. The hypoderm is thicker laterally and ventrally. In both the neural canals are large. The pharyngeal wall has externally a circular layer, then the basement tissue upon which the folded glandular coat rests. In this region (anterior third) it also presents a muscular sheath of external circular and internal longitudinal fibres, while various strong muscular fasciculi, apparently connected with protrusion and retraction, are attached to the sheath superficially. A large blood-vessel occurs over the insertions of the oblique muscles inferiorly, and another between the longitudinal dorsal muscles superiorly. Numerous minute ova existed in the perivisceral chamber.

In his remarks on *Prionospio steenstrupi* from Madeira, Langerhans[1] describes and figures the great "Leydigschen Fasern" of the ventral nerve-cord. As this species possesses two large neural canals towards the upper surface of the nerve-cord, some discrepancy appears to be present, for Langerhans shows only a single median dark band under the action of osmic acid.

Family Cirratulidæ.

The two divisions of the Cirratulidæ represented in the collection are separated by a wide interval in regard to habitat. Thus the genus *Cirratulus* is almost entirely a littoral form, abounding under stones in muddy and even odoriferous localities; while *Chætozone* frequents the deeper water, descending in the present case to 1250 fathoms, and apparently being partial to the blue mud, in which it probably burrows. This genus,

[1] *Zeitschr. f. wiss. Zool.*, Bd. xxxiv. p. 91, Taf. iv. fig. 3 1880.

however, has been found in comparatively shallow water on other occasions, as, for example, in the seas of Nova Zembla.[1]

Former voyagers have chiefly described representatives of the genus *Cirratulus*. Thus Schmarda gives six species of this genus, all of which are littoral. Kinberg mentions six new examples of the family, besides referring to two of Schmarda's. Grube found only a single *Cirratulus* amongst the Annelids of the "Gazelle," and none in Semper's series from the Philippines. Marenzeller, again, has two from Southern Japan, besides an example of Grube's genus *Acrocirrus*.

While the Challenger was at sea the late Prof. Dickie of Aberdeen had some fragments of *Melobesia* procured by the ship at St. Paul's Rocks sent him. These calcareous masses were perforated by boring Mollusks, Annelids, and Sponges. Amongst the Annelids were fragments of *Dodecaceria*, a member of the present family, and well known all over the world as a borer in shells, calcareous rocks, and similar substances.

Cirratulus, Lamarck.

Cirratulus capensis, Schmarda (Pl. XXIVA. figs. 9, 10).

Cirratulus capensis, Schmarda, Neue wirbell. Thiere, I. ii. p. 56, Taf. xxvii. fig. 213.

Habitat.—Found between tide-marks at Sea Point, near Cape Town.

A form of considerable size, reaching about 90 mm. in length and 5·5 mm. in breadth. Schmarda, who describes the animal from life, appears to have met with larger examples at Table Bay, for he gives the length at 200 mm., the breadth at 9 mm., and the length of the tentacles (branchiæ) at 15 mm.

In external configuration the species approaches the British *Cirratulus borealis* (a form furnished with eyes) especially as regards the blunt snout, the great size of the branchiæ, the distinctness of the body-segments, and the number of the hooks in the inferior division of the foot. The colour of the body in life is stated by Schmarda to be dark violet while the branchiæ are orange.

As in the British form the long flattened simple bristles anteriorly show well-marked serrations along the margin (Pl. XXIVA. fig. 9), and many have minute winged stalks (probably Algæ ?) parasitic on them. The anterior hooks are less tinted, more slender and less distinctly curved than the dark brownish posterior ones (Pl. XXIVA. fig. 10).

In the intestinal canal is muddy debris containing fragments of Crustacea, sponge-spicules, Diatoms, and other structures.

The cuticle and the thick glandular hypoderm of this form do not materially diverge from the arrangement in *Cirratulus cirratus*. The circular muscular coat in the same

[1] Théel, *op. cit.*, p. 54.

manner curves inward over the ovoid nerve-cords, leaving only the hypoderm and the cuticle external to the special area of the nerve-sheath. The fasciculi of the longitudinal dorsal and ventral muscles are similar to those in the common form.

This form so closely approaches the British species that separation is difficult. Both Schmarda and Kinberg found it at the Cape.

Cirratulus zebuensis, n. sp.

Habitat.—Dredged at Station 209 (off Zebu, one of the Philippines), January 22, 1875; lat. 10° 14′ N., long. 123° 54′ E.; depth, 95 fathoms; bottom temperature 71°·0, surface temperature 81°·0; sea-bottom, blue mud.

A fragment of the anterior region, measuring about 25 mm. in length and 4 mm. in diameter.

The head of this species is not much pointed, and though a little pigment occurs at the tip, there is no distinct evidence of eyes. The partial protrusion of the proboscis to some extent distorts the snout. The branchiæ have the usual arrangement, and belong to the larger type of such organs.

Unfortunately the fragment contains only the anterior bristles, no hooks being developed in this region. The bristles are elongated and slender, without the distinct knife-blade-like flattening observed in the preceding species. The serrations on the margin are less marked than in the latter.

It differs from many of its allies in the absence of hooks in the anterior region, even as far back as the fiftieth segment.

The fine greyish mud in the intestinal canal showed many Foraminifera, a few sponge-spicules, and one or two Diatoms.

In transverse section the chief difference from *Cirratulus cirratus* is the occurrence of more numerous fasciculi in both dorsal and ventral longitudinal muscles. While the cuticle also is well-marked, the hypoderm is somewhat thinner. The blood-vessels are distended with minutely corpusculated blood.

Cirratulus assimilis, n. sp. (Pl. XXIVA. figs. 11, 12).

Habitat.—From the shore at Bermuda, adhering to the bristles of *Eurythoë*.

A fragment of the snout and anterior region of a small specimen, measuring about 5 mm. in length, with a breadth of nearly 1 mm.

This form approaches the British *Cirratulus borealis*, but is not identical therewith. So far as can be gathered from the mutilated example, it presents the following characteristics.

The snout is flat, hoof-shaped, with a little dark pigment within the anterior border. On each side a row of eyes runs nearly transversely inward, a short distance behind the tip, but they do not meet in the centre. The rows are much less distinct than in the British form referred to, and one or two in each case occur behind the main series. The branchiæ have the same proportionally large size as in the British species.

The bristles do not show any noteworthy peculiarity except that they are short. The hooks, again (Pl. XXIVA. fig. 11), are decidedly more curved at the tip than in the British *Cirratulus borealis*.

In this species sections show that while the cuticle is slightly represented the hypoderm is thick. The circular muscular coat is fairly developed, but the oblique muscles are feeble and the longitudinal ventral groove is not formed. The nerve-area is comparatively large. The longitudinal dorsal and ventral muscles are somewhat thin, but they have a similar arrangement to those in the typical form. The large ventral blood-vessel occurs above the insertion of the oblique, and is distended in all the preparations.

Chætozone atlantica, n. sp. (Pl. XLV. fig. 8; Pl. XXIVA. fig. 12).

Habitat.—Dredged off Sombrero and St. Thomas, West Indies, in 390 and 470 fathoms.

The anterior fragment of a peculiar form, having at first sight the aspect of *Lumbriconereis*. It measures 35 mm. in length, and at its widest part has a diameter of 4·5 mm.

The head forms a broad cone without evident eyes. Two small pits, however, are present on the dorsum. The mouth opens in the buccal segment inferiorly, and is directed forward, while the folds in connection with the aperture are symmetrical. A fissure with a closely approximated plait at each side runs forward underneath the snout, while an inner and outer semicrescentic fold occur posteriorly, the latter being the longer. The body presents the usual flattened appearance of *Chætozone*, a marked median groove occurring along the ventral aspect, and a slight one along the dorsal surface.

The dorsal bristles (Pl. XXIVA. fig. 12) have the usual tapering structure, and in most a series of oblique striæ occur toward their insertion, and very minute serrations on the edge of the best marked examples. The ventral conform to the same type, some being about equal in length, most shorter and broader. Only bristles are present in the fragment, which has more than fifty segments.

Contrasted with those of *Chætozone setosa* the bristles are very much longer and more attenuated; but there is little in them that is diagnostic. The nearest approach to this form is one found by the "Porcupine" in the Mediterranean (Station 50), which likewise

is devoid of hooks. The bristles, however, are much less attenuate than in the West Indian species.

The greyish-white mud in the intestine shows multitudes of sponge-spicules, sand-grains, Diatoms, and Foraminifera. The organic admixture is evidently very large.

The body-wall in *Chætozone* is formed on a similar plan to that in *Cirratulus*. In this species the thin cuticle has mostly disappeared. The hypoderm is proportionally thinner than in the latter genus, and the flattened nerve-area is thus more superficial. The circular muscular coat is well developed, but the oblique muscles only slightly draw upon the raphe, and the former passes over (*i.e.*, within) the nerve-cords. Both dorsal and ventral longitudinal muscles are cut into numerous narrow fasciculi. A large median dorsal vessel occurs above the alimentary canal, and another inferiorly above the insertions of the oblique.

Chætozone, Malmgren.

Chætozone benthaliana, n. sp. (Pl. XXIVA. figs. 13, 14).

Habitat.—A fragment of the posterior end of a *Chætozone* dredged at Station 50 (off the North American coast, south of Halifax), May 21, 1873; lat. 42° 8′ N., long. 63° 39′ W.; depth, 1250 fathoms; bottom temperature 38°·0, surface temperature 45°·0; sea-bottom, blue mud.

The fragment measures about 48 mm. in length, and the greatest breadth anteriorly is 8 mm., exclusive of the bristles. It is thus a large form. The absence of the anterior region leaves us in doubt as to its connection with the previous species, especially as the latter had no posterior region. So far as can be judged from the narrowing of the body anteriorly, however, as well as the condition of the bristles, the present form would seem to want little of the anterior region.

The body is broad and flattened, especially on the ventral surface, which, indeed, slopes almost from the outer border inward to the whitish median line, so as to form a broad furrow. Dorsally the outline in transverse section is more convex, the median region, however, being also marked by a furrow, though no whitish line exists. The segments are distinctly marked throughout. Posteriorly the body gradually tapers to a point, and terminates in an anus, the rounded aperture being somewhat dorsal in position.

The bristles (Pl. XXIVA. fig. 13) anteriorly are nearly twice as long as in the previous form, constituting two conspicuous tufts, each borne on a somewhat prominent setigerous process, connected by a ridge; indeed the feet are well marked, even to the tip of the tail. The elongated bristles, both dorsal and ventral, show a slight constriction above their insertion into the foot, indicating, though faintly, the differentiation of the shaft from the more flattened and in many minutely serrated tip, the serrations, however, being

only visible at the broader part. This differentiation would hardly be noticed unless familiarity with the condition in *Chætozone setosa* suggested it. Toward the tail the dorsal bristles become considerably shorter and stronger, and amongst them are a few with very stout bases and tapering tips. They project only a short distance beyond the setigerous process. In the same region ventrally two or three stout spines occur (Pl. XXIVA. fig. 14). Such are very slightly curved; indeed in many views they appear to be straight.

The greyish mud, with which the intestine is distended, abounds in Diatoms, minute Foraminifera, Radiolarians, and fragments of sponge-spicules.

Chætozone pacifica, n. sp.

Habitat.—Dredged at Station 169 (off East Cape, North Island, New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; sea-bottom, blue mud.

Length about 43 mm., breadth 6 mm. at the widest part.

In general configuration this form approaches the previous (*Chætozone benthaliana*), and since the anterior region is injured, and most of the bristles absent, it would have been at first sight difficult to recognise the dorsal from the ventral surface, or indeed until the bristles had been carefully examined.

The snout seems to be absent, a pouting mass of the buccal apparatus projecting from the front. The body is a flattened ellipse in transverse section, more convex on the dorsal surface, and marked by a deep groove on the ventral aspect, along the median line of which the nerve-cord is very evident. A slight groove also exists along the centre of the dorsum, as in the former species. The body tapers to a point posteriorly, and, as in the latter, has a terminal anus.

The feet are not quite so prominent as in *Chætozone benthaliana*, but have a similar structure, viz., a dorsal and ventral papilla connected by an intermediate (vertical) ridge. They are rendered more evident by the presence of a little dark pigment. Each bristle-papilla has a series of long, slender simple bristles tapering to a fine point, and without evident serrations. The bases have a deep golden hue, especially the parts inserted into the foot. The ventral, as usual, are somewhat stouter than the dorsal.

Posteriorly, instead of the ventral spines of *Chætozone benthaliana*, both tufts are composed of simple bristles, some being shorter and stouter than the others, especially in the ventral group, resembling, indeed, the median short bristle in the figure of the former species (Pl. XXIVA. fig. 14).

The fine greyish mud in the intestine is not rich in organisms, only a few Diatoms and minute sponge-spicules being present.

Family Halelminthidæ.

Few examples of this group seem to have been noticed by explorers. None are indicated by Grube in the "Gazelle," but he describes one in the collection made by the Novara Expedition, and two in that from the Philippines. Schmarda and Kinberg give no addition to our knowledge of the family.

The genus *Notomastus* ranges from the littoral region, where it is abundant, to considerable depths, *e.g.*, 1340 fathoms, or, as mentioned by Ehlers in the "Porcupine" collection, 1443 fathoms. *Capitella* reaches about half that depth. They are partial to muddy ground, though on the east coast of Scotland they are frequent in sand.

They are common in the seas of Greenland, occur at various points between it and Madeira, and probably extend much farther south.

Eunotomastus, n. gen.

Eunotomastus grubei, n. sp. (Pl. XXIVa. fig. 16).

Habitat.—Dredged at Station 33 (off Bermuda), April 4, 1873; lat. 32° 21′ N., long. 64° 35′ W.; depth, 435 fathoms; surface temperature, 68°·0; sea-bottom, coral mud.

The specimen is fragmentary and much injured, apparently having been partially dried, so that the description is imperfect. It measures about 30 mm. in length and 1·8 mm. in breadth.

It seems to have a short conical snout devoid of eyes. The general appearance of the anterior region agrees with *Notomastus*, though the segments are longer, and the central furrow less marked. A few of the anterior bristle-tufts are absent, but about sixteen pairs appear to have been present. The bristles agree in structure with those of the common *Notomastus*, though they are somewhat shorter.

The second region of the body is not differentiated in the same manner as in the ordinary form, the anterior gradually merging into the succeeding. The dorsal bristles are continued (in four segments) after the commencement of the hooks. The latter (Pl. XXIVa. fig. 16) show much more distinct teeth on the crown, and their shape also diverges. An evident enlargement occurs just within their insertion.

The segments of the second region of the body differ from those of the common British form and others in presenting none of the transverse ridges dorsally, only slight prominences for the rows of hooks. The ventral ridges are also simple transverse elevations.

It is unknown whether this or any of the previous forms possesses branchiæ posteriorly, since no trace of that region remains.

Fragments of sponge-spicules, minute Foraminifera and Radiolarians, with coarse sand-particles, are present in the alimentary canal.

In transverse section this species is characterised by the conspicuously dense cuticle and the well-developed hypoderm. The nerve-cords are large and connate, forming a somewhat elliptical area in the ventral indentation of the thick circular muscular coat. The median neural canal is best seen superiorly in the ganglionic region. In the anterior third of the body the longitudinal coat is symmetrically arranged in eight divisions, each tightly bound internally by the translucent sarcolemma. On each side is a great ventral mass, above which is another about half the bulk, followed dorsally by a much smaller division and then a larger median one. If the strong band passing from the second interval (*i.e.*, between the second and third muscles from the dorsal middle line) to the ventral border on each side of the nerve-area represents the oblique muscle, then each great inferior division is homologous with the longitudinal ventral of other forms. The position of the nerve-cords, moreover, at once differentiates this species from such types as *Notomastus*, in which the cords are wholly within the muscular layers. This form, indeed, connects *Cirratulus* and *Chætozone* with the Halelminthidæ.

Notomastus, Sars.

Notomastus agassizii,[1] n. sp. (Pl. XLVI. fig. 3; Pl. XXIVA. fig. 15).

Habitat.—Dredged at Station 47 (off the coast of New York), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; surface temperature, 42°·0; sea-bottom, blue mud.

A fragment of the anterior region of a form apparently identical was brought up with the sounding-line off San Antonio, Cape Verde Islands. The specimen is small, and has been dried.

In common with many European examples, the specimens consist only of the anterior bristle-bearing region and a portion of the succeeding. The length of such fragments is therefore of little moment, but it may be mentioned that the largest has a diameter of 6 mm. at its widest part.

In external appearance (Pl. XLVI. fig. 3) this form very closely resembles the common British species (*Capitella capitata*). The snout, perhaps, is a little more acute, and there is no trace of pigment-specks. The buccal and the anterior regions appear to correspond in the same way, the latter having eleven series of bristle-bundles, each segment being marked by a median furrow, which runs quite round in the line of the bristle-tufts. The surface presents the usual tessellated aspect.

The bristles agree with those in the British species, and no appreciable difference can be detected in regard to the hooks (Pl. XXIVA. fig. 15). The minute denticulations in the crown of the latter are feebly developed, indeed, they are hardly distinguishable. A

[1] Named after Alexander Agassiz.

slight diminution of the neck occurs a short distance below the wing, then it gradually increases to the shoulder, and again narrows inferiorly. The shoulder is less abrupt than in *Notomastus sarsii* and even than in *Eunotomastus grubei*.

The sandy mud in the intestine of those from Station 49 contained many minute Diatoms, a few sponge-spicules, and fragments of Radiolarians.

In section this differs from the British representative in the less numerous and more massive divisions into which the great longitudinal muscles are separated. The ventral are especially large. The fibrils are also much coarser. The inner surface of the muscular bundles is covered by a thick though translucent sarcolemma, which may have some influence in retaining them in position. The alimentary canal and nerve-area occupy the same position.

Prof. Verrill's[1] descriptions of *Notomastus luridus* and *Notomastus filiformis* are not sufficiently exact to give certainty in diagnosis, so that it is possible the above may be connected with either.

Notomastus (?) sp.

Habitat.—A variety was dredged at Station 149H, off Cumberland Bay, Kerguelen; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; surface temperature, 39°·8; sea-bottom, volcanic mud.

In external appearance (Pl. XLVI. fig. 2) it corresponds with the ordinary British form, and also in regard to the structure of the bristles and hooks, as well as of the proboscidian papillæ. The dorsal lamellæ of the second region of the body, however, are larger. It likewise is only a fragment, consisting of the snout and eight or nine segments behind the bristles. No eyes are visible.

In minute anatomy this form closely agrees with the common British species. No neural canal, however, is visible, but, as the specimen is small, this feature is not one on which much reliance need be placed. The genus *Notomastus* probably agrees with *Arenia*, De Quatrefages.[2]

Dasybranchus, Grube.

Dasybranchus (?) sp. (Pl. XLV. figs. 13, 14; Pl. XXIVA. fig. 17).

Habitat—Trawled at Station 233B (south of Yedo, Japan), May 26, 1875; lat. 34° 18′ N., long. 133° 35′ E.; depth, 15 fathoms; surface temperature, 66°·3; sea-bottom, blue mud.

A headless fragment, evidently of a large species, which measures about 40 mm. in length and 6 mm. in breadth.

[1] Rept. Invert. An. Vineyard Sound, pp. 610, 611.

[2] Annelés, p. 250.

It differs conspicuously from any of the previous forms in having branchiæ arranged in the form of a tuft on each side, on the ventral aspect. The segments are narrow, consisting of a smooth dorsal arch cut by two transverse furrows into three divisions. Just as the arch bends down laterally a prominent ridge (bearing hooks) occurs, and after an interval another elevated soft ridge lies above the branchiæ. At the summit (dorsal and very prominent) is an isolated papilla. A dense branchial tuft is situated at the lower border of the foregoing ridge in each segment. These are short, slightly branched processes, with much corrugated external walls, the transverse wrinkles being probably due to the contraction of the longitudinal muscular fibres, which are very distinct in many of the preparations. No evident blood-vessels are noticed, but most are filled with an opaque central mass composed of brownish globules and granules, probably blood. The perivisceral fluid contains larger corpuscles. The ventral arch is completed by a narrow ridge between the branchiæ of opposite sides, the hook-bearing portion being more prominent than the rest.

The dorsal and ventral hooks agree in structure (Pl. XXIVA. fig. 17), but both are so minute that their exact nature is not readily determined. The crown seems to have only one spine above the large fang. The form of the shoulder and shaft approaches that of a *Notomastus* from the coast of New York.

The greyish mud with which the intestine is filled presented sand-grains, Diatoms in great profusion, fragments of sponge-spicules, Radiolarians, and other structures.

The cuticle and hypoderm are somewhat thin in proportion to the size of the body, but the circular muscular coat is well marked. A considerable ventral longitudinal muscle occurs on each side, the thickest mass being situated close to the median fissure, at the wide inner part of which the nerve-cords lie. The dorsal longitudinal are thinner, and, like the ventral, are somewhat coarsely fasciculated.

The imperfect condition of the specimen does not permit a decisive opinion with regard to its relationship with other species. It appears to be closely related to the ordinary species, viz., *Dasybranchus caducus*, Grube, and also to the forms described by the same author from the Philippines.[1]

Family Maldanidæ.

The members of this family have occurred in the collections of most exploring expeditions, though seldom in great numbers, probably because they are not amongst those readily observed in the contents of a dredge. Compared with other expeditions, the representatives of the group in the Challenger are remarkable for their number, as well as the great depths to which not a few descend. Indeed some of the forms, such as *Nicomache benthaliana*, are amongst the dwellers in the great deeps, *e.g.*, 2300 fathoms.

[1] *Op. cit.*, p. 189, &c.

and there can be no dubiety in regard to their habitat, viz., on the sea-bottom. About a third of the species obtained by the Challenger are abyssal. Thus, besides the form mentioned, *Maldane malmgreni* inhabits 1525 fathoms, *Maldanella antarctica* ranges from 1260 to 1950 fathoms, and at the latter depth is also *Praxilla abyssorum*. *Maldanella valparaisiensis* frequents the great depth of 2225 fathoms, and another of the same genus, *Maldanella neo-zealaniæ*, descends to 1100 fathoms.

In the previous voyages they had not been found at great depths. Thus Kinberg's series of twelve belongs to the shore or comparatively shallow water, though ten are new. Schmarda's two species were procured between tide-marks at the Cape of Good Hope. Only a single form occurs in Grube's Annelids from the "Gazelle," and one from the Philippines, and there is nothing noteworthy in either habitat. Sars found both *Maldane* and *Clymene* range to 300 fathoms. From the "Porcupine" expedition, again, Ehlers had six species, one of which reached the depth of 1443 fathoms.

In regard to food, no group shows more strikingly the value of Diatoms, Radiolarians, and Foraminifera as the original food-producers for fishes and the higher forms. These groups constitute the chief nourishment of the deep-sea and many other Annelids, and the majority would seem to have lived on the spot where they have been swallowed, to judge from their appearance in the alimentary canals of the Annelids.

The discrimination shown by this family in the formation of their tubes is at once apparent on contrasting the mud swallowed as food with that composing the tube. Almost invariably the latter is coated with the coarser Foraminifera, the larger Radiolarians, and the rougher sand-particles, and this even in instances where there would have been no obstacle to the admission of the one as well as the other into the buccal orifice.

In the diagnosis of species it would have been very difficult to apply Prof. Grube's[1] method of calculating the number of the bristle-bearing segments, since only fragments as a rule were brought up by each haul of the dredge or trawl. Considerable reliance, however, can be placed on the structure of the hooks and other points.

The genera have a wide distribution.

Maldane, Grube.

Maldane sarsi, Malmgren.

Habitat.—Dredged at Station 232 (south of Yedo, Japan), May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature 41°·1, surface temperature 64°·2; sea-bottom, green mud.

The specimens are comparatively small when contrasted with the Canadian examples of the species. The only complete one measures about 48 mm., with a diameter of 1·5 mm. at its widest part.

[1] Jahrb. d. Schles. Gesellsch., Breslau, 1868, December 18; also *Ann. and Mag. Nat. Hist.*, ser. 4, vol. ii. p. 393, 1868.

The specimens agree in appearance, number of segments, and other particulars with the ordinary forms, the only point worthy of notice being the very distinct crenations of the ventral margin of the anal disk. The bristles and hooks coincide with those from Europe and America.

One specimen is in a friable tube composed of greyish mud. The outer layers could easily be removed, as usual, from the pale chitinous lining next the body of the animal.

The greyish mud in the alimentary canal abounds in Diatoms and Radiolarians, but with a very few minute sponge-spicules. Peculiar cylindrical transparent rods also are common, often with an acute point at one end, though sometimes with the point enclosed; and when the apex is broken off a bifid condition is caused by the sloping sides of the cylinder remaining attached. A few fragments of minute Crustacea are also present.

In transverse section the body-wall differs from that of *Praxilla* and *Nicomache* in the much greater thickness of the cuticle and in the extreme attenuation of the circular coat, which, indeed, can hardly be discerned. The hypoderm is largely developed on the ventral and lateral walls of the body. The nerve-area, instead of being carried outward by the tense and thick circular coat as in the forms mentioned, passes inward between the longitudinal muscles. Moreover, no canal is present. This passage inward is probably connected with the rudimentary condition of the circular muscular coat. The longitudinal ventral muscles are massive internally but taper to a thin layer which goes upward almost to the dorsal arch. The oblique muscles thus arise from the superior lateral region, and are fixed to the circular coat on each side of the nerve-area. The longitudinal dorsal form a very thin sheet of fibres on each side of the median line. The fasciculi of the muscles are comparatively coarse. A corpuscular fluid occupies the perivisceral chamber.

The *Clymene koreni* of Hansen,[1] from the Norwegian North Atlantic expedition, seems to belong to the same genus as the present form.

Maldane malmgreni, n. sp. (Pl. XXVa. fig. 1).

Habitat.—Trawled at Station VI. (off the Strait of Gibraltar), January 30, 1873; lat. 36° 23′ N., long. 11° 18′ W.; depth, 1525 fathoms; bottom temperature 36°·0, surface temperature 58°·0; sea-bottom, Globigerina ooze.

A somewhat softened fragment of the anterior end of a large *Maldane*, measuring about 36 mm. in length, with a diameter of fully 5 mm.

It differs from *Maldane sarsi*, or *Maldane biceps*, in having a perfectly even rim round the anterior disk, with the exception of a slight notch over the mouth. The first bristled segment (that next the cephalic) presents only a long tuft of bristles, which are

[1] *Op. cit.*, p. 40.

rather more slender and elongate toward the tip than in *Maldane sarsi*. No hooks occur on this segment. The next and succeeding segments bear a series of hooks which differ from those of either species mentioned. The great fang has three distinct teeth (Pl. XXVA. fig. 1) above it, and the curvature between the latter and the tuft of fibres is peculiar. The fibres themselves are finely divided, that is, are more numerous and more slender than usual. In regard to the form of the body, the animal appears to correspond with its congeners so far as the segments show.

The greyish sandy mud in the alimentary tract abounded in Foraminifera (chiefly *Globigerinæ*). Only a few minute sponge-spicules are present.

The structure of the body-wall in this species offers no feature of note. The nerve-cords occupy the ordinary position outside the circular muscular coat. The hooks are arranged in vertical rows, with the points of the great fangs directed ventrally.

The *Maldane tenuis* of Théel[1] comes near this form, both generally and in the structure of the hooks. Unfortunately no figure of the latter is given.

Maldanella, n. gen.

Maldanella antarctia, n. sp. (Pl. XLVII. figs. 1, 2; Pl. XXVA. fig. 11).

Habitat.—Numerous small specimens were trawled at Station 146 (west of Prince Edward's Island) December 29, 1873; lat. 46° 46′ S., long. 45° 31′ E.; depth, 1375 fathoms; bottom temperature 35°·6, surface temperature 43°·0; sea-bottom, Globigerina ooze.

A large specimen occurred in the trawl at Station 152 (in the middle of the Southern Ocean), February 11, 1874; lat. 60° 52′ S., long. 80° 20′ E.; depth, 1260 fathoms; surface temperature 34°·5; sea-bottom, Diatom ooze.

Another large example, which like the former, however, was incomplete, was trawled at Station 157 (midway between Heard Island and the southern point of Australia), March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; bottom temperature 32°·1, surface temperature 37°·2; sea-bottom, Diatom ooze.

No example is quite complete, and the size is variable. The large specimen from Station 152, and which has twenty-two segments, extends in length to 125 mm., with a diameter at its widest part of 6 or 7 mm.

The cephalic lobe[2] (Pl. XLVII. figs. 1, 2) resembles that of *Praxilla*, but there is a very small ventral conical process in front. Moreover, instead of the prominent median ridge usually seen, there is a broad flattened elevation, barely extending halfway upward,

[1] *K. Svensk. Vetensk. Akad. Handl.*, Bd. xvi., No. 3, p. 57, figs. 52–54.

[2] The anterior views of the head in the group vary, so that too much reliance cannot be placed on them.

and being quite continuous with the central conical papilla at the ventral edge. A slit-like furrow occurs in the median line inferiorly above the papilla. On each side of the ridge is a broad shallow groove. The rest of the cephalic plate is marked (above or superiorly to the ridge) by transverse furrows, chiefly arranged with the concavity of the curve inferiorly. The margin of the cephalic plate is formed of the usual lamelliform process, which is most developed inferiorly on each side of the ventral median notch. A few slits occur in the margin above the anterior half, but the dorsal edge is smooth to the naked eye, though a series of fine crenations are visible under a lens. The buccal segment is comparatively short.

The succeeding segment bears only a row of bristles as in *Maldane*, and with the next six segments forms the first region of the body. These segments diminish in depth to the fifth, the sixth and seventh again increasing. All have more or less of a collar, the anterior third of the segment, that is the region in front of the rows of hooks, being of the usual white glandular aspect. The eighth segment also presents a narrow whitish belt, but it resembles the succeeding rather than the preceding rings.

The hooks (Pl. XXVa. fig. 11) present three very distinct teeth, and traces of a fourth above the great fang, the curve of the neck below the latter being carried abruptly outward to the vibracular eminence, so as to give considerable diameter to the region; moreover, the crown and the adjoining region are carried backward, the neck curving forward to the shoulder. The vibrissæ are of moderate length, and tolerably numerous. These hooks emerge through specialised apertures in the cuticle and hypoderm, the former presenting a ring round the aperture, and dipping inward to the shoulder of the hook.

The bristles have no distinctive feature. Amongst the specimens from Station 146 is a fragment apparently representing a reproduced tail. The terminal region forms a rounded projection directed ventrally, and has a soft conical papilla posteriorly. From the fact that at the base of the latter the last segment shows a row of hooks and bristles on each side, it is apparently an effort at reproduction.

The greyish creamy material in the intestine of the specimen from Station 157 consisted almost entirely of Diatoms of various kinds, some yellowish cells and granules, a Radiolarian or two, and an infinitude of fine siliceous threads, connected, perhaps, with the latter or some other group. The contents of the alimentary canal of the example from Station 152, again, present a distinct modification, for while the Diatomaceous element remains much the same, even as regards species, there are not quite so many of the long, siliceous hairs, and the Radiolarians are in greater abundance. The yellowish cells and granules probably pertain to the latter group. The whitish mass in the canal of the specimens from Station 146 altogether differs from the foregoing, for though Diatoms are tolerably abundant, Foraminifera, especially *Globigerinæ*, are the main constituents, one or two minute Radiolarians, and an occasional sponge-spicule only being present in the calcareous mud.

The tube from Station 157 consisted of a tough hyaline lining invested by a soft greyish mud, which was mainly composed of Radiolarians and Diatoms, the minute and long spicules formerly alluded to, a few fragments of Ostracoda, and other debris. The Radiolarians are much more prominent in this than in the mud from the bottom of the sea, or the intestine of the Annelid, probably because the animal selected the largest masses for the manufacture of its tube. The tube from Station 152 is long and fragile, measuring 190 mm. in length, and having a diameter of 9 mm. In the preparation it is somewhat flattened, and has a similar composition to the previous one; only it feels more gritty from sand-grains, and coarse spicules of sponges. A large number of Diatoms enter into its composition, and it is studded all over with a *Globigerina*-like form roughened with pointed lozenges arranged very closely. Here also the selective power of the animal is shown in the divergence between the contents of the alimentary canal and the material composing the tube. The composition of the tube from Station 146 is quite different, being almost entirely composed of *Globigerinæ* and other Foraminifera. One or two Radiolarians occur amongst the former.

The cuticle forms a thin layer, but the hypoderm is comparatively thick, especially in the ventral median line. The nerve-area is small, and has a large neural canal superiorly. The circular muscular coat is well marked. Both dorsal and ventral longitudinal muscles taper in section from the bulbous exterior border inward, and are nearly equal in size. The dorsal muscles approach each other in the median line, but the ventral are widely separated, the oblique muscles being attached beyond the outer border of the nerve-area. The alimentary canal anteriorly forms a small firm tube, with plaited inner lining, at the superior central region, the rest of the body-cavity being occupied by coarsely granular and large cells, probably pertaining to the perivisceral fluid.

It is difficult in not a few cases to follow Kinberg's descriptions [1] of this group, but it is possible that his genus *Chrysothemis* is somewhat allied to *Maldanella*, though the absence of the funnel is a striking difference.

Maldanella valparaisiensis, n. sp. (Pl. XLVI. fig. 12; Pl. XLVII. fig. 3; Pl. XXV$_A$. fig. 12).

Habitat.—Trawled at Station 298 (a little south of Valparaiso), November 17, 1875; lat. 34° 7′ S., long. 73° 56′ W.; depth, 2225 fathoms; bottom temperature 35°·6, surface temperature 59°·0; sea-bottom, blue mud.

The length of the specimen is 64 mm., and its greatest diameter (a little behind the front) 5 mm.

The cephalic lobe is broadly truncate, the marginal lamella being perhaps less-

[1] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1866, p. 340.

developed than in the previous species. There is, moreover, no notch above the ventral third in profile, and no minute crenations along the dorsal edge. The ventral lobes of the marginal lamellæ come very close to each other, since there is no median papilla projecting between them as in the former species. The flat ridge in the median line of the cephalic plate proceeds downward to the lamellar edge, and just before reaching it each lateral region spreads out to interrupt the adjoining furrow, while the median ridge passes to the edge, but, as before mentioned, does not project beyond it. The latter part of the ridge has a cylindrical outline. Transverse crescentric furrows mark the dorsal region of the cephalic plate, as in the previous species.

In the succeeding region of the body, comprising in all eight segments, the somites possess white bands anteriorly, and the collar is developed in seven, commencing in that behind the buccal. There are twenty-three segments in front of the funnel. As in *Maldanella antarctica*, that behind the buccal has only a tuft of bristles; the rest have hooks and bristles, with the exception of the three last (in front of the funnel), in which the papillæ are unarmed.

The hooks (Pl. XXVa. fig. 12) approach those of the former species very closely, but the distal region is curved backward even more decidedly, the vibracular eminence is less prominent, and the entire crown somewhat differs in shape. In some of the hooks from the posterior row the minute teeth above the third from the great fang are more evident than in those from the anterior segments.

The funnel agrees in general with that in *Praxilla*, having about twenty-six broadly conical teeth, with a grooved anal projection or papilla in the centre, which does not appear to be a prolapse.

The fine brownish mud in the intestine only contained a few rounded bodies with siliceous perforated capsules like those of Radiolarians, an occasional sponge-spicule, and a Diatom.

The tube is composed of the same brownish mud, but of a somewhat coarser description than the foregoing. Thus it had larger round Radiolarians, more massive sponge-spicules, a few Foraminifera, and coarser sand particles.

The cuticle is extremely thin, whereas the hypoderm is comparatively thick, though its tissue is lax. The nerve-area is somewhat semicircular, with the rounded neural canal applied to the circular muscular coat superiorly. The oblique muscles are inserted above the outer edge of the area, and thus differ from those of *Maldanella antarctica*. The longitudinal muscles have similar proportions. The perivisceral corpuscles resemble minute mulberries, the spheres being composed of nearly equal globules, while the latter under a high power present more minute granules internally.

The relations of the *Clymene grossa* of Dr. Baird,[1] from the Strait of Magellan, are uncertain. It may be connected with either of the foregoing species.

[1] *Journ. Linn. Soc. Lond.*, vol. xi. p. 95.

Maldanella neo-zealaniæ, n. sp. (Pl. XLVII. fig. 4; Pl. XXVA. fig. 13).

Habitat.—Trawled at Station 168 (off Kidnapper Point, New Zealand), July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature 37°·2, surface temperature 57°·2; sea-bottom, blue mud.

The sole example is imperfect, consisting of twenty-two segments; and as the last two are hookless, probably only the penultimate and the funnel are absent. The length is about 51 mm., and the greatest diameter a little more than 2 mm.

The cephalic lobe is characterised by the fulness of its marginal lamella, which forms a frill all round, with the exception of the median ventral region where the papilla occurs. It is as usual deepest a little behind the anterior margin (Pl. XLVII. fig. 4), and though some wrinkles are present at the termination of the anterior third, no notches or crenations proper exist, either there or dorsally. The dorsal portion of the lamella is remarkably deep, and, moreover, presents no traces of a median depression or notch. The upper surface of the cephalic plate is marked by a regular series of curved lines, the concavity being directed forward (or ventrally) as in the former species. Instead, however, of being flat, this surface has a low median ridge. The latter commences a little below the middle, is somewhat more prominent than in allied forms, narrows a little at the commencement of its lower third, and then flattens out like the legs of a Y to become continuous with the ventral median process. The furrows at the sides are slightly marked and shallow, ceasing at the expansion just alluded to. They are tinted of the usual dull yellow hue. The ventral median process is a flat rounded papilla, and the surface behind it is slightly hollowed out (between the legs of the Y). Another feature is the presence of a furrow on each side, sloping outward and slightly downward from the dorsal end of the median ridge to the margin, cutting off a somewhat triangular area on each side of the yellowish furrow.

In the form of the body this species agrees with the preceding, but the hooks (Pl. XXVA. fig. 13) slightly differ. They agree in having three teeth above the great fang and an indistinct fourth, but the vibracular eminence is much more pronounced than in the last species, and the curve between it and the great fang is larger.

The fine greyish mud in the alimentary canal was not rich in organisms, only a few minute Foraminifera being observable, and an occasional Diatom.

The cuticle in this form is also comparatively thin, but the hypoderm is remarkably thick, the long and minutely granular cells being arranged in close parallel rows from without inward, and thus presenting a radiate appearance. The circular muscular coat is powerful, and the dorsal and ventral longitudinal are proportionally large. The oblique muscles occupy the same relations as in the last species.

Nicomache, Malmgren.

Nicomache capensis, n. sp. (Pl. XLVI. fig. 4; Pl. XXIVA. figs. 18, 19; Pl. XXXVIIA. fig. 2).

Habitat.—Collected between tide-marks at Sea Point, near Cape Town.

A fragment consisting of about eight anterior segments, with a diameter of 2 mm.

The general form and appearance of this species agree with those of *Nicomache lumbricalis*, the differences in regard to the aspect of the dorsum of the snout being due to the state of the spirit and the degree of contraction.

The single ventral spine in the first three bristled segments is perhaps a little more curved towards the tip than in *Nicomache lumbricalis*. A very decided difference exists in the spinous forms in the dorsal group of bristles (Pl. XXIVA. fig. 18), for they are comparatively short, and the spines very boldly marked.

The ventral hooks, again (Pl. XXIVA. fig. 19), differ from those of *Nicomache lumbricalis* in having a more elevated crown furnished with more numerous teeth, five or six of these being visible above the great fang. The contour in front also diverges, a prominent process, separated by a well-marked interval from the fang, bearing the vibrissæ.

The somewhat coarse sand in the alimentary canal had many and varied sponge-spicules. Diatoms and Foraminifera were rare.

In section the body-wall generally corresponds in structure with *Nicomache lumbricalis*, the longitudinal ventral muscles greatly exceeding the dorsal in size. The form of the nerve-area and the position of the neural canal are similar. An evident distinction, however, is the attachment of the oblique muscles in the middle line (Pl. XXXVIIA. fig. 2) above the neural canal, whereas in *Nicomache lumbricalis* they remain separate, *i.e.*, are fixed on each side of the neural canal. A large blood-vessel lies close to the inner border of each ventral muscle.

Nicomache japonica, n. sp. (Pl. XLVI. fig. 5; Pl. XXIVA. fig. 20).

Habitat.—Dredged at Station 232 (south of Yedo, Japan), May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature, 41°·1; sea-bottom, green mud.

The single example is about 70 mm. in length, and at its widest part has a diameter of 2 mm.

In the general form of the head and anterior region this form also corresponds with *Nicomache lumbricalis*, but there are four segments anteriorly, each with the single inferior spine, instead of three as in the common species. The only peculiarity is that

the tip in some of these has a hastate outline, from a constriction and then a dilatation. The dorsal bristles are similar. The ventral hooks, again (Pl. XXIVA. fig. 20), quite differ in the shape and denticulations of the crown, and in the general contour of the shoulder and shaft, from the previous species as well as *Nicomache lumbricalis*. About five distinct teeth and traces of a sixth occur above the great fang, so that the crown is peculiarly elongate. The shoulder is very distinctly marked.

Mud rich in Diatoms, minute spicules of sponges, the peculiar elongated cylindrical spicules with the pointed ends, and fragments of various kinds, occurred in the intestinal canal.

The body-wall of this species offers certain peculiarities. Thus while the cuticle and hypoderm have average development and the position and structure of the nerve-area are typical, the muscular coats are greatly diminished in bulk. The circular forms only a linear band round the body. The longitudinal ventral muscles are limited in area, and present a series of almost isolated fasciculi. The longitudinal dorsal also consist of a thin layer of similar fasciculi. The oblique muscles are well marked, and are fixed ventrally over the outer border of the nerve-area. The blood-vessels are of large size, and the perivisceral corpuscles have the usual mulberry-appearance.

Nicomache (?) *benthaliana* (Pl. XLVI. fig. 8; Pl. XXIVA. fig. 21).

Habitat.—Trawled at Station 241 (in the Pacific, west of Japan), June 23, 1875; lat. 35° 41′ N., long. 157° 42′ E.; depth, 2300 fathoms; bottom temperature 35°·1, surface temperature 69°·2; sea-bottom, red clay.

Only the funnel and a few adjoining segments are present.

The terminal cup or funnel is of a more delicate structure than usually seen, and shows twenty-two teeth of a lanceolate form, and arranged very closely. Moreover, grooves run between each, so that they possess a peculiar distinctness, especially as the funnel is semitranslucent. Three bristled segments exist in front of the funnel, besides the penultimate (if the space with an unarmed lateral eminence be such). In regard to the latter arrangement, therefore, the fragment approaches *Nicomache* rather than *Praxilla*, and the structure of the hooks (Pl. XXIVA. fig. 21) tends in the same direction. Five rapidly diminishing teeth occur above the great fang, only three, however, being distinctly seen, and the crown is comparatively little developed—a contrast to the condition in such as those of *Nicomache japonica* in fig. 20 of the same plate. The fibres (vibrissæ) arise a very short distance below the great fang, and there is a comparatively slight constriction above the shoulder. Indications of a lateral series of teeth appear at the bases of the larger fangs. The hooks are decidedly larger than in *Praxilla*.

The funnel approaches that of *Praxilla* rather than that of *Axiothea*.

Maldane (?) sp. (Pl. XXVa. fig. 9).

Habitat.—Fragments of this form, presenting neither head nor tail, were dredged at Station 47 (off the American coast, near New York), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; sea-bottom, blue mud.

The fragments are enclosed in friable tubes composed of minute grains of sand, mostly of a pale colour. The friability is due to the small quantity of the chitinous secretion.

The hooks (Pl. XXVa. fig. 9) present about five teeth above the great fang, and the crown is somewhat elevated. A distinct interval below the great fang, and then a projection occur, the short vibrissæ arising from the latter. The anterior region of the hook is of average length, the posterior is of considerable length. The organs somewhat resemble those of *Maldane* in the projection at the origin of the vibrissæ.

The alimentary canal contains somewhat coarse fragments of sand, a few Diatoms and sponge-spicules, besides minute organic structures.

This species is distinguished on section by the delicacy of the cuticle and the great thickness of the hypoderm. The circular and other muscular coats are well developed, the longitudinal ventral being somewhat massive.

Maldane (?) *atlantica*, n. sp. (Pl. XXVa. fig. 4).

Habitat.—Dredged off Sombrero and St. Thomas, West Indies, in 470 and 390 fathoms.

A softened fragment of the anterior end of a species of middle size consisting of fifteen segments. The greatest diameter is 2·5 mm.

The cephalic lobe is so injured that nothing more can be said of it than that it seems to have an extended margin which had been considerably developed dorsally. No eyes are visible along the anterior (inferior) margin as in an allied form from the Channel Islands. The cephalic segment is very short, and it is followed by another comparatively short. Two others similar though slightly longer succeed, and these apparently form the first region of the body. The three next segments are somewhat short, and are furnished anteriorly with a distinct white (glandular?) belt. Moreover, the anterior margin in each forms a free collar for the latter part of the preceding ring. The fourth is also supplied with a white belt, but does not seem to project much forward. The condition of the specimen negatives a minutely accurate description.

A conspicuous tuft of bristles occurs in the segment succeeding the united cephalic and buccal. No hooks seem to accompany the bristles. The following has a similar tuft of rather slender, tapering winged bristles, and a few hooks, forming a short row. The next

have considerable rows of hooks. In structure (Pl. XXVA. fig. 4) these hooks resemble certain forms dredged by the "Porcupine" and procured in Guernsey. There is a prominent angle for the vibrissæ after an interval below the great fang, and in this respect the organ approaches *Maldane* rather than *Axiothea*.

Praxilla, Malmgren.

Praxilla köllikeri,[1] n. sp. (Pl. XLVI. fig. 6; Pl. XXVA. fig. 2; Pl. XXXVIIA. figs. 3, 8).

Habitat.—Dredged at Station 174 (south of the Fiji Islands), August 3, 1874; lat. 19° 6′ S., long. 178° 14′ E.; depth, 140 fathoms; surface temperature, 77°·0; sea-bottom, coral mud.

The anterior region (about nine segments) of a small *Praxilla*, having a diameter of fully 1 mm.

The most evident distinction from *Praxilla prætermissa* is the occurrence of three long segments behind the buccal, instead of two. The cephalic plate has a much more expanded (almost foliaceous) margin all round. A deep notch occurs anteriorly, the centre being filled up by a flattened projection of a blunt conical form. In a lateral view (Pl. XLVI. fig. 6) the inferior (anterior) two thirds of the foliaceous margin is prominent and entire, as well as separated from the rest by a notch. Posteriorly the border is less elevated; and it is also crenated, with a median notch in the centre. The foliaceous region presents a row of dots (probably glands) some distance within the free edge. The centre of the upper surface of the plate is marked by two grooves, which somewhat diverge inferiorly (anteriorly), the intermediate ridge being much more acute than in *Praxilla prætermissa*. Anteriorly the ridge splits, the limb on each side merging into the edge of the flat cone. The latter arrangement is indicated in *Praxilla prætermissa*, but is much more pronounced in this form.

The first three segments have each a single spine of the usual shape inferiorly. These segments are also considerably larger than the succeeding. Moreover, the anterior margin of the next ring (fifth) is produced in the form of a collar which projects forward over the posterior part of the fourth segment. This segment (fifth) appears whitish anteriorly as in the corresponding one of *Praxilla prætermissa*, but the latter presents the ordinary thickening (in spirit) at the margin and has no collar.

The hooks (the first row of which are borne by the fifth segment) differ from those of *Praxilla prætermissa* in having much more elevated crowns (Pl. XXVA. fig. 2) and more numerous teeth. These organs are smaller than in *Maldane* and *Nichomache*.

Both cuticle and hypoderm (Pl. XXXVIIA. fig. 3) are comparatively thin, and are

[1] After Prof. Kölliker, who, amongst his other heavy labours, wrote on the Annelids of the West Coast of Scotland.

often absent in the sections (from imperfect preservation). The circular muscular coat is fairly formed, and a thin basement-layer occurs between it and the hypoderm. The fibres of the circular ring do not form so evident an inner boundary to the nerve-area as usual, and the latter passes inward between the ventral muscles. A large neural canal is also present (Pl. XXXVIIa. fig. 8). The longitudinal muscular layers are well defined, the ventral forming two elongated masses, bulky inferiorly and tapering superiorly, and occupying double the circumferential extent of the dorsal. The latter in section form two elliptical muscles on each side of the median line, and constitute the dorsal arch. The oblique muscles are inserted over the outer border of the nerve-area. The alimentary canal has circular and longitudinal fibres externally and a frilled epithelial coat of considerable thickness internally. Toward the thin upper region of each longitudinal ventral muscle is an ovoid sheath filled with minute spherical bodies with a nucleus, which are probably the reproductive organs.

This form somewhat approaches the *Praxilla collaris* of Claparède,[1] from Naples.

Praxilla lankesteri,[2] n. sp. (Pl. XXVa. fig. 3).

Habitat.—A form that at first sight can hardly be distinguished from the foregoing was dredged at Station 232 (south of Yedo, Japan), May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature 41°·1, surface temperature 64°·2; sea-bottom, green mud.

The cephalic plate agrees generally with *Praxilla köllikeri*, but there are no crenations on the dorsal margin, though it is notched in the middle line. There are also three segments provided with the simple inferior spine, and a collar at the anterior margin of the fifth segment as in the foregoing.

The hooks, however, show a slight divergence (Pl. XXVa. fig. 3), for the fascicle of bristles is attached close to the base of the chief fang inferiorly, whereas an interval occurs in the former example. Moreover, the crown is less elevated, and the teeth less numerous, about five, as a rule, being visible in profile above the great fang.

The somewhat coarse sandy mud in the alimentary canal of this form abounded in Diatoms, sponge-spicules, and other organisms.

While in external configuration there is a close similarity between this and the foregoing species, there is considerable divergence on section of the body-wall. Thus the hypoderm in the present species is thick, and the circular muscular coat is firm and well defined,—keeping the semicircular nerve-area quite outside its continuous ventral region. No neural canal is visible. The longitudinal ventral muscles form a compact and somewhat rhomboidal mass on each side, and do not occupy so large a part of the circumference.

[1] Annél. Chétop., p. 454, pl. xxvi. fig. 2.

[2] After Prof. Ray Lankester, who has paid much attention to the Annelida.

The dorsal, also bulky, cover on the other hand a much more extensive area than those in the previous species. The oblique muscles are inserted exactly over the outer border of the nerve-area. A minutely granular mass occurs on each side at the hiatus between the longitudinal muscles. It probably represents the reproductive elements.

Praxilla (*?*) *challengeriæ*, n. sp. (Pl. XXXVA. fig. 5).

Habitat.—Dredged at Station II. (off Setubal on the coast of Portugal), January 13, 1873; lat. 38° 10′ N., long. 9° 14′ W.; depth, 470 fathoms; surface temperature, 57°·0; sea-bottom, green mud.

A fragment of the posterior region of a slender elongated form which has apparently been dried.

The chief peculiarity about the configuration of the body is the condition of the tail, which is pointed, but whether this be the result of injury or otherwise is unknown. The acutely tapered organ presents a notch for the anus, probably on the dorsal surface. The last segment of the body (*i.e.*, the ring behind the terminal row of hooks) is much elongated, slender, and thrown into several dilatations like the body of a *Sipunculus*. The other segments are also proportionally long.

The hooks (Pl. XXXVA. fig. 5) have a comparatively short distal region, and a characteristic and pronounced shoulder. The teeth above the great fang point forward, and thus make a long crown. Four of these are especially distinct, and a fifth less evident. A slight interval occurs between the great fang and the origin of the fibres. The bristles have winged, tapering tips.

The hooks are certainly peculiar in the shortness of the upper region, and approach those of certain species from Guernsey and Herm, though the distal region in the latter is longer.

Praxilla capensis, n. sp. (Pl. XXXVA. fig. 8).

Habitat.—Dredged at Station 141 (Cape of Good Hope), December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms; bottom temperature 49°·5, surface temperature 66°·5; sea-bottom, green sand.

Only two fragmentary examples of the anterior region were found, the largest measuring about 30 mm., with a diameter of fully 2 mm.

This form approaches the succeeding from Kerguelen, and also *Praxilla praetermissa*, in general appearance. The central cephalic ridge, however, does not extend so far backward (or dorsally), and the two lateral ridges overhanging the grooves do not proceed even so far, the three segments following the buccal (which are also longer proportionally

than in *Praxilla kerguelensis*) have largely developed spines. The next segment has no distinct whitish band, but the next four have. It is uncertain whether the first has lost its band, but both specimens are in the same condition.

The hooks approach the type of *Praxilla assimilis*, the crown being comparatively flat and broad (Pl. XXXVa. fig. 8), with upwards of six teeth above the great fang. The outline of the shoulder differs, both from the form mentioned and *Praxilla kerguelensis*, since the anterior is much less than the posterior projection, a feature, however, on which much reliance cannot be placed. The vibrissæ arise a very little below the great fang. The inferior region of the hook is comparatively short.

The somewhat coarse sand in the intestine contained a considerable number of Diatoms, besides sponge-spicules, and a few Foraminifera and Gregarinæ.

The hypoderm in this species is somewhat firmer than in *Praxilla prætermissa*, so that the tissue in section is less cellular, and retains its outline better. The nerve-area in each is similar, and the same may be stated in regard to the circular muscular coat. The longitudinal dorsal muscles in the new species present an evident distinction, for they are connate for a considerable distance in the median line. The longitudinal ventral are more compact and massive. In the intervals between the bristle-tufts a thin band of muscular fasciculi occurs between the dorsal and ventral longitudinal muscles, and below the upper attachment of the oblique.

Praxilla kerguelensis, n. sp. (Pl. XLVI. fig. 7 ; Pl. XXVa. fig. 6).

Habitat.—Dredged at Station 149G (off London River, Kerguelen Island), January 29, 1874 ; lat. 48° 50′ S., long. 69° 18′ E., in 110 fathoms ; surface temperature, 40°·2 ; sea-bottom, volcanic mud.

None of the specimens are perfect, but it seems to be a species of some size, reaching a diameter of 2·8 mm.

The cephalic plate considerably differs from that of *Praxilla prætermissa*, having a much more expanded margin, with a notch (in lateral views) at the commencement of the upper (or posterior) third. The margin then becomes a little narrower toward the median dorsal notch, which is somewhat shallow. Anteriorly (ventrally) the central conical process is well marked, and it has a pit at the base posteriorly, where it abuts on the central ridge of the flat cephalic plate. The ridge stretches from the conical process almost to the dorsal margin of the plate, is acute, and clearly defined by a deep groove on each side. The posterior part of the ventral median process is comparatively isolated, so that it looks like a disk appended to the boldly defined median ridge. The proboscis is studded with proportionally large and distinct papillæ of a slightly conical or globular shape.

The first three segments behind the buccal form the anterior region, and have simple stout spines inferiorly, which in the third amount to four. The spines are slightly oblique at the tip. These three segments are of moderate length, and the second and third have free anterior margins, forming in each case a collar for the preceding segments. The succeeding five segments are conspicuously marked by a white band at the anterior margin, in front of the rows of hooks, and nearly the whole of this in each constitutes the collar round the base of the preceding segment. The anterior segments (so far as they are present) are short, probably from contraction in spirit. The ventral surface is marked by the usual pale band, which in a few of the anterior segments merits the name of a ridge.

The rows of bristles present for the most part an alternation of stout and slender forms. The former have peculiarly modified, narrow wings, followed by a slight enlargement, and very long and finely tapered tips. On the other hand, the latter are simple tapering bristles without evident wings.

The uncini (Pl. XXV*a*. fig. 6), in profile, show about five teeth above the great fang. The fibres arise close under the latter. The distal region of the hook is comparatively long, and the shoulder well marked.

The food of this form is peculiarly rich in various Diatoms, small and large, sponge-spicules, and other organic debris. Few sand-grains occur in the pulpy greyish mass.

The contrast between the foregoing food and the same materials composing the exterior of the tube is striking. The coarser, larger, and rougher spicules of sponges glisten all over the latter like minute hairs, while Diatoms in great numbers, rounded bodies (Radiolarians?) like ova filled with coarse yellowish granules, and the chitinous walls of which are devoid of sculpturing other than the very minute dots seen in many ova, and a few sand particles are amongst the most conspicuous features. The tube is friable and mostly membranous. Its anterior region is formed chiefly of the secretion of the animal.

In the general configuration of the body-wall on section, this form approaches *Praxilla köllikeri*. The circular muscular layer, however, appears to be thicker, and the nerve-area is kept outside the tense line of this coat ventrally. The bulky region of both dorsal and ventral longitudinal muscles is inferior, each tapering in its progress upward, a feature prevalent in the group. The oblique muscles are inserted just outside the nerve-area. The perivisceral corpuscles are mulberry-like with nodular surfaces.

Praxilla assimilis, n. sp. (Pl. XLVI. fig. 9; Pl. XXV*a*. fig. 7).

Habitat.—Dredged at Station 149*h*. off Cumberland Bay, Kerguelen Island: lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms: surface temperature, 39°·8; sea-bottom, volcanic mud.

This form is considerably less than the foregoing, therefore it has to be borne in mind that age may be connected with some of the alterations to be noted. On the whole, however, the distinctions seem to indicate specific separation. The length of the fragment is about 23 mm., and its diameter does not exceed 1 mm. at its widest part.

The cephalic lobe agrees in general outline with the foregoing, but the median ridge is broader, does not extend so far upward (or backward), and the furrows are broader. At the bottom of the latter are pigment-specks. The ventral conical projection is proportionally larger. The proboscis agrees with that of the former in the shape of the bluntly conical papillæ. The three segments behind the buccal are elongated in the specimen, but little weight can be placed on this fact. There are also five segments in the next region, but they do not show a collar anteriorly, though this may likewise have been altered by the preservation.

The hooks (Pl. XXVa. fig. 7) present a much broader crown with more numerous teeth above the great fang. The distal region is, on the whole, shorter than in *Praxilla kerguelensis*, and there is, perhaps, a more evident constriction above the shoulder. The hook somewhat resembles that of *Praxilla lankesteri* (Pl. XXVa. fig. 3).

In transverse section the hypoderm in this species is proportionally thicker than in *Praxilla kerguelensis*, as likewise is the circular muscular coat. The longitudinal ventral muscles cover a larger area than the dorsal, but both are proportionally massive. In several of the anterior sections (Pl. XXXVIIa. fig. 4) the mode in which the proboscidian sheath is slung is clearly shown. By the decussation of fibres from the circular coat in the dorsal median line the thick muscular sheath is fixed dorsally, while its junction with a curved series of fibres passing between the same coat (circular) below and through the dorsal muscles, and from side to side, affords a powerful purchase in extrusion. Bands of fibres from the foregoing platform join the oblique muscles in their progress to the sides of the nerve-area. The latter in some of the sections anteriorly slightly presses the circular coat upward between the ventral longitudinal, but in others the tense circular fibres are nearly transverse in their course across the area. The perivisceral corpuscles are typical.

Praxilla occidentalis, n. sp. (Pl. XXVa. fig. 10).

Habitat.—A fragmentary specimen, apparently belonging to the posterior third of the body, was dredged at Station 45 (off the American coast, near New York), May 3, 1873; lat. 38° 34′ N., long. 72° 10′ W.; depth, 1240 fathoms; bottom temperature 37°·2, surface temperature 49°·5; sea-bottom, blue mud.

All that can be said of it is that the hooks (Pl. XXVa. fig. 10) approach most nearly those of a common species from the Gulf of St. Lawrence. They differ from those of

Praxilla gracilis and *Praxilla arctica*. The crown is not much elevated in profile, though six or seven teeth are noticeable above the great fang. The fibres arise close under the base of the latter.

The soft sandy mud in the alimentary canal contains *Globigerinæ* and other Foraminifera, the long cylindrical siliceous structures, each with a pointed extremity, a few small Diatoms, and occasionally a fragment of a sponge-spicule.

The condition of the specimen is unsatisfactory for minute description, and the cuticle and hypoderm have disappeared. The circular muscular coat is of remarkable thickness, but the longitudinal shows no feature of note. Two greatly dilated vessels occur in the dorsal median line over the alimentary canal, and a considerable ventral trunk lies over the nerve-area.

Praxilla (?) fragment (Pl. XXIXA. fig. 15).

Habitat.—Dredged at Station 76 (off the Azores), July 3, 1873; lat. 38° 11′ N., long. 27° 9′ W.; depth, 900 fathoms; bottom temperature 40°·0, surface temperature 70°·0; sea-bottom, Pteropod ooze.

A fragment, apparently of a small *Praxilla*, the hooks of which (Pl. XXIXA. fig. 15) present about five teeth above the great fang. The shoulder is well marked, and a distinct interval occurs between the great fang and the vibrissæ.

The tube, which is in fragments, is almost entirely composed of *Globigerinæ*, large and small, with sand-grains and a few sponge-spicules. The surface of the tube, with its coarse *Globigerinæ*, affords a contrast to the finer mud swallowed by the minute inhabitant.

Praxilla abyssorum, n. sp. (Pl. XLVI. figs. 10, 11; Pl. XXXVII. fig. 5; Pl. XXXIXA. figs. 1, 10).

Habitat.—Trawled with *Maldanella antarctica* at Station 157 (in the Antarctic Ocean), March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; sea-bottom, Diatom ooze.

The specimen is incomplete, but measures about 58 mm. in length, and barely 2 mm. at its widest diameter in front.

There are nineteen segments of the body in the fragment. The truncated snout has a little obliquity, but not much, and a slightly raised thickened margin all round, with a deep notch at each side, while the anterior border is the more elevated. The face, or cephalic plate, is marked by the usual median elevation (Pl. XLVI. fig. 11) and flat, hoof-shaped lateral depressions. There is nothing special in the appearance of the

body, except that a Crustacean parasite was attached to the fifteenth segment by two small processes on the under surface of the snout. There are four segments behind the buccal, each with strong simple spines and tufts of bristles. Some of the bristles are furnished with a distinct wing on each side, while others are simple, slender, tapering structures.

The rows of hooks commence at the fifth segment. They present three well-marked teeth above the great fang (Pl. XXXIXA. fig. 1), the throat under the latter being only very slightly hollowed out, much less than in *Maldanella antarctica*, to which, however, the shape is somewhat allied. There is a prominent posterior shoulder.

No food existed in the alimentary canal.

The tube has a whitish appearance, and is composed almost entirely of Diatoms, massive reticulated structures, probably Radiolarian, and the slender cylindrical spicules formerly alluded to. It is slightly friable, but by no means brittle, even when the tough hyaline lining is removed.

A characteristic feature in the transverse sections of this abyssal form is the great thickness of the cuticle. The hypoderm is also of considerable bulk, and the circular coat is well marked. The longitudinal ventral muscles exceed the dorsal in area, and are not much tapered superiorly. The nerve-area (Pl. XXXVIIA. fig. 5) has passed upward, so that it lies between the ventral longitudinal muscles, and even projects within them, so that the oblique muscles appear to be attached to the projecting angles of the nerve-mass. The circular muscular layer is indistinct in this region in the preparations, but appears to form no appreciable boundary on the inner border of the area.

Praxillinicola kröyeri, n. gen. and sp. (Pl. XXXIXA. fig. 10).

This Crustacean parasite consists of nine segments. The body of the female is about 2·5 mm. in length, narrow and elongate. The cephalo-thorax is somewhat shield-shaped, its transverse diameter, however, considerably exceeding its antero-posterior. The only differentiation this region presents is its central projection or rostrum on the anterior ventral margin, and the two short processes, which probably represent a pair of antennæ, by which it adheres to its host. The abdomen has two dilated segments anteriorly, followed by four somewhat narrower ones. A narrow segment occurs in front of the rounded posterior end, which presents a central genital aperture. So far as could be seen through the opaque whitish body, the central region was occupied by the ovaries, which contained numerous ova. The description of the *Donusa clymenicola* of Nordmann[1] has not been available, but in the elongate form of the body the new species approaches the *Rhodinicola elongata* of Levinsen,[2] a form found on *Rhodine loveni*. It differs, however, in the absence of the post-abdomen, and in the rudimentary condition of all the appendages.

[1] Stated by Levinsen to be in the Bull. de l'Acad. St. Petersburg, 1864, but which is not.

[2] *Vidensk. Meddel. f. d. nat. Foren. i Kjøbenhavn*, 1877, p. 360, Taf. vi. figs. 1–4.

Family Ammocharidæ.

The most interesting feature in this group is the great depth inhabited by all procured by the Challenger, 1340 fathoms being the shallowest and 2975 the deepest. Yet another member of the same family, *Owenia* or *Ammochares*, is found abundantly between tide-marks on various parts of our own coasts, and in the neighbouring waters beyond, whence it finds its way into the stomach of the cod. The *Psamocollus*[1] of Grube is synonymous with Malmgren's *Myriochele*, one of the most widely distributed amongst the types under examination, but which hitherto seems only to have been procured in deep water.

The Greenlandic specimens described by Malmgren came from a depth of 250 fathoms, and the representatives of the genus in the Norwegian North Atlantic expedition descended much deeper, viz., to 1215 fathoms. It may yet be discovered, however, in shallow water or in the littoral zone.

Kinberg mentions two species, but none are given by Schmarda, or by Grube in the "Gazelle." The latter, however, describes one in the Philippine series and one from the Novara expedition.

Hansen gives two new species of *Myriochele* in the Norwegian North Atlantic expedition. Two species are given by Ehlers from the "Porcupine," and one (*Myriochele*) reached the depth of 1380 fathoms.

The first allusion to the group was made by Delle Chiaje under the name of *Owenia* in 1842, though Grube's subsequent description under the title of *Ammochares*, in 1846, was more complete. *Owenia*, as Grube asserts, has already been used by Kölliker to distinguish a Ctenophore and also by Prosch for a Cephalopod. He urges, therefore, that his name ought to stand.

Myriochele, Malmgren.

Myriochele heeri, Malmgren (Pl. XXVa. fig. 14, *a*, *b*, *c*).

Myriochele heeri, Malmgren, Annulata Polychæta, p. 102, Tab. vii. fig. 37.

Habitat.—Dredged at Station 20 (to the east of the Antilles or Caribbee Islands), March 12, 1873; lat. 18° 56′ N., long. 59° 35′ W.; depth, 2975 fathoms; bottom temperature 36°·0, surface temperature 75°·0; sea-bottom, red clay.

After the dredge-line was veered to 4000 fathoms, nearly five miles, it was brought up full of red mud, Sir Wyville Thomson tells us, and having entangled about the mouth and imbedded in the mud many of the tubes of this species.

Sir Wyville Thomson reports[2] that "the tubes with their contents were handed over to Dr. v. Willemoes-Suhm, who found the worms to belong to the family

[1] Annel. Novara-Exped., Bd. ii. p. 30, Taf. iii. fig. 5 (sep. Abd.).

[2] The Atlantic, vol. i. p. 201.

Ammocharidæ (Claparède and Malmgren), closely allied to the *Maldania* or Clymenidæ, all of which build tubes of sand or mud. The largest specimens dredged are 120 mm. in length by 2 mm. in width. The head is rounded, with a lateral mouth. There is no trace of cephalic branchiæ. The worm consists of only from seventeen to twenty segments; the first few of these are very long, about 17 mm., while those of the posterior portion of the body are only 5 mm. in length. The segments are not divided from one another; but the *tori uncinigeri*, which are occupied by the hair-like setæ, and the elevations bearing small *uncini*, indicate the beginning of a new segment. The number of small hooks on the *tori uncinigeri* is very large. . . . . There is a pair of glands in each of the segments, from the second to the seventh. The position and structure of these has been described by Claparède in the genus *Owenia*, in which, however, there are only four pairs. Most of the specimens examined are females, and contain many eggs.

"There is no doubt that this Annelid is closely allied to the genus *Owenia*, but it differs from it in the absence of cephalic branchiæ. Malmgren has, however, already proposed the name of *Myriochele* for a form in which this absence of branchiæ occurs. The description of the northern form, on which Malmgren's genus is founded, is not at hand, so that it is impossible in the meantime to determine whether the two forms are identical or specifically distinct."

The foregoing account by the lamented Dr. v. Willemoes-Suhm is the more valuable because the condition of the preparation is unsatisfactory. All the larger tubes had been slit and their contents removed; and, as the animals are quite pulpy and devoid of either head or tail, very little information can be gleaned from them. Moreover, careful search revealed no trace of either extremity of the body in the small fragmentary tubes, and none amongst the microscopic slides.

The hooks occur on somewhat shorter pads than in *Owenia*, and the crown is bifid (Pl. XXVA. figs. 14, *a*, *b*, *c*). Malmgren's figure of the hook, which, with his description of *Myriochele heeri*, was published in 1867,[1] is nearly, but not quite, in accordance with the structure of that in the present form, for the inferior fang or tooth in his figure is too short, but this is probably due to position. In certain views, indeed, only one fang is visible, so that it is probable they arise nearly on a level, or are truly bifid.

The hooks in the genus *Myriochele* conform to the foregoing type, though Dr. Hansen describes and figures a remarkable exception in the collection made during the Norwegian North Atlantic expedition. In this species (*Myriochele sarsii*, Hansen[2]) the bifid terminal region is separately articulated to the shaft. This is unusual in the group.

The bristles present toward the tip very fine lateral serrations, no distinct spikes being noticeable in the preparation.

[1] Annulata Polychæta, Spetsbergiæ, &c., Helsingfors, 1867.
[2] Den Norske Nordhavs-Exped., p. 41, Taf. vi. figs. 6–12.

The food of the Annelid consists of the reddish mud amongst which it dwells. Sir Wyville terms this red clay—mud containing a number of gritty particles, though on the whole comparatively smooth, and with scarcely a trace of carbonate of lime. A minute examination of the contents of the alimentary canal shows that the sand-grains are rare and small, and that a few Diatoms (chiefly circular) and occasionally a beautifully reticulated Radiolarian are present.

Further insight, however, is obtained into the nature of the sea-bottom by an investigation of the tubes, which are composed of a somewhat tough, pale, chitinous secretion internally, and externally coated with sand-grains and other structures. Conspicuous amongst the latter are numerous globular or rarely moniliform arenaceous Foraminifera of an ochreous colour, while the microscope shows a large number of more minute arenaceous forms, some apparently divided into chambers, innumerable fragments of sponge-spicules, curious circular stellate disks, and tips of peculiar spines (hollow at the base). Few or no Diatoms are visible on the tubes.

There can be no doubt, therefore, that living arenaceous Foraminifera abound on this sea-bottom of reddish clay, and with the Diatoms and Radiolarians contribute to the support of such higher forms as *Myriochele*.

Myriochele heeri, Malmgren, var. (Pl. XXVIA. fig. 5*d*).

Habitat.—A fragmentary and minute specimen was dredged at Station 47 (off the American coast, near New York), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; surface temperature, 42°; sea-bottom, blue mud.

The hooks of this form (Pl. XXVIA. fig. 5*d*) are of course much smaller than in the previous species, and appear to conform more closely to Malmgren's figure. There is, however, no satisfactory evidence that the forms are distinct. The chief difference is in the curvature of the neck of the hook, which is more decided in the present form, and there is less of the shoulder usually visible below the teeth.

The tube, like the animal, is fragmentary, measuring in diameter about 0·5 mm. It is composed of sponge-spicules and transparent grains of sand, the former beautifully arranged in parallel series, bound here and there by cross-bars. In some parts of the tube sand-particles predominate, in others the sponge-spicules are most prominent.

Some of the hooks in the ordinary *Owenia*, towards the end of the row, show two short and rounded processes at the tip. The rest seem to have a single tooth. In Hebridean, English, and Spanish examples the double tip occurs on the hooks. *Myriochele*, therefore, can hardly be distinguished from *Owenia* for this reason.

Myriochele heeri, Malmgren, var.

Habitat.—Trawled at Station 325 (in the Atlantic, off the coast of Buenos Ayres), March 2, 1876; lat. 36° 44′ S., long. 46° 16′ W.; depth, 2650 fathoms; bottom temperature 32°·7, surface temperature 70°·8; sea-bottom, blue mud.

Unfortunately both extremities are absent, so that little can be made out of the specimen. It is about 30 mm. in length by 1·2 mm. in diameter. The hooks, however, seem to correspond with those of the examples from Station 20.

The intestine contains sandy mud with sponge-spicules.

There is little, considering the differences in the nature of the sea-bottom, to distinguish the tube of this form from that dredged at Station 20. The same brownish-orange globular Foraminifera, and various other arenaceous forms of the same type, sponge-spicules, one or two globular perforated bodies like Foraminifera, and an occasional Diatom characterise the exterior, while the chitinous lining is the same. One end of the tube is as usual more leathery.

Myriochele pacifica, n. sp. (Pl. XXVa. fig. 15).

Habitat.—Trawled at Station 272 (in the middle of the Pacific), September 8, 1875; lat. 3° 48′ S., long. 152° 56′ W.; depth, 2600 fathoms; bottom temperature 35°·1, surface temperature 79°·0; sea-bottom, Radiolarian ooze.

This specimen also is fragmentary, neither anterior nor posterior end being present. It measures about 90 mm. in length and fully 1 mm. in diameter.

The ridges for the hooks in this form are large (as in *Owenia*), and the hooks differ slightly from those of the previous forms in the outline of the teeth and the shoulder (Pl. XXVa. fig. 15). A margin, however, must be made for variation, since this is a much larger form than the preceding.

All these examples of *Myriochele* approach each other closely, and the very imperfect condition of every specimen makes the diagnosis unsatisfactory.

The greyish-white contents of the alimentary canal showed numerous Radiolarians.

The fragments of the tube have a deep brownish colour, and are composed of an inner tough layer of glistening chitinous secretion. Externally is a flocculent brownish coat mainly made up of Radiolarians, with a few sponge-spicules here and there. The diameter of the tube is about 2 mm. One end is thin and leathery. They are accompanied by a few fragments of the tube of a *Hyalinœcia*.

The *Myriochele danielsseni* of Hansen[1] has hooks with the tips somewhat dilated, but much less abruptly than in the present form.

[1] *Op. cit.*, p. 42, Taf. vi. figs. 13–15.

Family Hermellidæ.

The number of species procured by the Challenger is comparatively small, probably because the group is a shallow water or littoral one, as, indeed, the localities given by the foreign authors together with the habits of European forms show.

Kinberg describes seven species, of which six are new, and under no less than five new genera. Schmarda gives four species, chiefly from the littoral zone. Grube describes one from the Philippines and one in the series collected by the "Gazelle."

The occurrence of Nematoid parasites and Gregarinæ in the alimentary canal is interesting.

It is curious that no large masses of the tubes of the Hermellidæ come either from the Cape or the Australian region where they are common.

Dr. Baird[1] states that an example of this group (*Sabellaria saxicava*) bores in somewhat soft rock in Esquimalt Harbour, Vancouver Island. This is an unusual feature.

Sabellaria, Lamarck.

Sabellaria (*Pallasia*) *johnstoni*,[2] n. sp. (Pl. XLVII. figs. 5, 6; Pl. XXVa. figs. 16–23).

Habitat.—From the littoral region, St. Vincent, Cape Verde Islands.

A species of considerable size, measuring about 40 mm., inclusive of the tail, and 4·5 in diameter at its widest portion.

The body is divided into three well-marked regions, viz., the cephalic, anterior, and posterior, and in addition the tail constitutes a long appendage.

The cephalic region is split from the anterior margin to the base of the dorsal hooks superiorly, and ventrally as far back as the mouth. This wide division gives the anterior region a characteristic appearance, which is further intensified by the dark brownish mottling of the dorsal aspect. Moreover, a dark brown belt runs along the outer margin of the opercular region, and as the papillæ in this are pale, they appear like a series of white studs. From the dorsum the divergence of the halves of the opercular region is very marked, the junction being characterised by a broad groove with a chitinous hook at each side. These hooks (Pl. XLVII. fig. 5) are large and powerful, and strongly curved toward the somewhat sharp extremity. A reserve hook of similar shape is present at the base dorsally, its unworn tip being more acute than the older. These organs are probably of considerable importance in the economy of the animal, as for attaching it to the margin of its tube or other convenient structure. Unfortunately, however, no

[1] *Proc. Zool. Soc. Lond.*, February 10, 1863.

[2] After Dr. George Johnston, of Berwick-on-Tweed, whose labours amongst the British Annelids deserve grateful remembrance.

tube is present in the collection, and nothing is known of its habits. The curved anterior margin of the region shows a double ridge with a groove between. The outer ridge has the dark brown belt studded with the white papillæ, formerly alluded to, along its external aspect, while internally, a continuous one of the same colour extends from the ventral to the dorsal margin. Upon the ridge are the outer paleæ, which form a single row. They possess a stout shaft (Pl. XXVa. fig. 16) for insertion into the tissues, its lower region being marked by close transverse lines, then by similar but slightly wavy lines, further up, below the pectinations, by a wider series of lines still more undulated, which present lateral ridge-like projections, the part immediately adjoining the pectinations, indeed, somewhat resembling the minute structure of wool. This region is also constricted. The lateral ridge-like processes gradually increase in distinctness from below upward, and soon assume the appearance of curved pectinations, which become longer toward the tip, the latter very rarely being perfect, probably from the brittle nature of the tissue. It is difficult to get a complete view of the pectinations on both sides, probably because the paleæ are twisted. The undulating transverse lines pass upward a little after the pectinations begin, then become indistinct and disappear. On the outer border of the ridge are the whitish papillæ, from seven to nine in number. The largest and longest is the last at the ventral edge, and it points inward from the prominence at the commencement of the inner paleæ. The last dorsal is small, and is situated just opposite the base of the great chitinous hook on each side. The inner ridge is less supplied with pigment than the outer, in one example being perfectly pale, while in another a pale brownish belt occurs externally, and an intensely brownish portion both externally and internally at each end, where it joins the outer row. The inner paleæ spring from the top of the ridge, increasing in length from above downward toward the ventral series. These processes are hollow and somewhat triangular in transverse section, diminishing superiorly and inferiorly. The tip (Pl. XXVa. fig. 17) is slightly curved and moderately pointed, while the central cavity nearly reaches the extremity. A series of transverse bars occurs both superiorly and inferiorly, and are probably due to septa which strengthen the somewhat brittle organs. While the outer row has a tendency to slope externally, these slant decidedly forward and inward. They are very brittle, rarely more than the tip remaining entire after mounting, as in the figure.

Inferiorly the cephalic fissure is very extensive, each limb presenting a linear series of transverse ridges, from ten to twelve in number. From these and the rest of the opposing surfaces the dense masses of filiform branchiæ arise.

The mouth opens just behind the ventral fork as a prominent orifice, provided anteriorly with two large labial palpi, and laterally with a lanceolate cirrus. The external fold of the mouth forms a thick crenate margin, while a pair of thinner and somewhat frilled inner lips occurs between them. Deep brown pigment exists round the mouth,

and extends along the anterior palpi. Just behind the lanceolate cirrus on each side is a tuft of beautifully pinnate bristles (Pl. XXVa. fig. 18). The pinnæ slant very regularly in a distal direction; while a few transverse markings occur in the shaft inferiorly.

Dorsally the mottled brownish cephalic bars or markings are continued evenly backward in the median line a considerable distance, so that there is no separation of the cephalic region on this surface. Laterally, however, a branchial appendage indicates a distinction, and on each side, below the latter, are three processes, viz., a dorsal, ventral, and median, the two former being more filiform than the latter. The separation is completed by a fold which, on each side, runs inward ventrally to the mouth. These lateral appendages probably indicate a segment, and the tuft of bristles on each side of the mouth may be the ventral bristles pertaining to it, though in such a case the lateral palpi at the mouth must have passed forward into the buccal segment. The fact, however, that these bristles differ very decidedly from the following series would show that there is no necessity for strictly connecting them with the first body-segment.

The next three segments are well defined, each bearing the usual pair of branchiæ, the dorsal tuft of strong bristles and the lateral lappet, with its ventral group of more slender bristles.

The dorsal bristles (Pl. XXVa. fig. 19) form a linear series of stout flattened oar-shaped organs, widening gradually from the base upward to the tip, the latter, however, being drawn to a short point. The edge of the thin flattened region at the extremity (a modification of the ordinary wings) is hispid with minute spines, which extend for some distance downward on the blade. Between each of these is a minute bristle (Pl. XXVa. fig. 20) more decidedly resembling an oar, and with proportionally longer spines on the tip. The shaft is distinctly narrowed beneath the terminal region or blade.

The ventral tuft of bristles, though smaller, conforms to the same type; the tip, however, is much more tapered (Pl. XXVa. fig. 21), and furnished with longer spines than the corresponding series in the dorsal tuft. In the same way, the more slender intermediate bristles assume a pennate aspect, somewhat after the manner of the ventral buccal tuft, but more finely spiked. A complete series of gradations is thus clearly seen in these bristles, from the boldly pennate ventral, to the less pennate intermediate ventral forms, then to the boldly hispid oar-shaped kinds, and finally to the stout dorsal series, where all that remains of the pennate arrangement is a slightly hispid tip, only detected by careful examination.

The posterior region of the body follows the last mentioned, and in it the dorsal bristles are absent. A ridge for hooks extends from the base of the branchiæ in front downward to the ventral surface, the process beyond terminating in a filiform cirrus, followed by a tuft of long delicate, tapering bristles with regular spinous rows. In each tuft there are a few more finely spinose than the rest, both forms being shown in Pl. XXVa. fig. 22, *a*, *b*. These bristles continue to the posterior end of the animal.

The anterior hooks (Pl. XXVa. fig. 23) have about eight teeth, the largest occupying the middle, the first and especially the last (which seems to be partly adnate) being smaller. The posterior hooks are less, and have a more decided dorsal curve than the anterior; otherwise they are similar, having from seven to eight teeth.

The branchiæ are incomplete, but appear to number twenty-three or twenty-four. The absence of many posteriorly may have been accidental, but if otherwise, they are not continued so far backward as in *Sabellaria spinulosa*.

The contents of the alimentary canal consisted of sandy mud in which were fragments of minute Crustacea, a few Foraminifera, fragments of sponge-spicules, minute Algæ, and parasitic Nematoids. The latter had bluntly pointed heads and rounded tails. A few Gregarinæ were also present. In the posterior region of the canal peculiar areolar membranes exist, but their relationships are doubtful.

The complexity of the anterior region of the body in section is considerable. Externally it is covered by a very thin layer of cuticle, and a narrow stripe of hypoderm containing the pigment. The circular muscular coat is best marked dorsally, for ventrally, in a line with the roots of the dorsal hooks, it is merged into the intricate muscular mass occupying the entire area of the region. The general appearance of the centre of this region is somewhat like the tongue. Dorsally are the roots of the two great hooks, while, laterally, are the paleæ. The inner row has its concavity directed outward and backward, the dorsal end having paleæ circular on section, the ventral and outer flattened paleæ. Each of the latter organs has an outer chitinous investment and a brownish central region. The branchial processes have a somewhat rigid chitinous ring, which retains its shape on section, under the ciliated hypoderm, and an inner axis connected with the vascular supply. Considerable nerve-trunks are noticed in the branchial region under the ventral hypoderm.

The intricate muscular stroma of the cephalic region shows certain changes as the cerebral ganglia and the mouth appear. Thus, just in front of the ganglia, a conspicuous band of transverse fibres occurs in the central region. As soon as the ganglia are outlined, a powerful transverse muscular band occurs above and beneath them, the rest of the area consisting of a complex series of radiate and oblique fibres.

Behind the ganglia the intricacy of the muscular apparatus surrounding the buccal region is great, and the nerve-cords have now assumed a lateral position. When the mouth becomes enclosed the cords form two large rounded masses in section toward the inner and upper border of each longitudinal ventral muscle, and the dorsal muscles are indicated. Just before the cords unite in the first ganglion a peculiar fan-like muscular arrangement is caused on each side of the gullet by the fibres connected with the great thoracic bristles. The nerve-cords have not yet reached the hypoderm, but are invested by interwoven muscular fibres inferiorly, the ventral muscles externally, and the oblique internally.

In the posterior region of the body, again, a great change ensues, for the central part is occupied by the alimentary canal, the intermediate region by the generative products, and the lateral by the great longitudinal muscles. The ventral form two compact oval masses with the nerve-cord and the neural canal at the upper and inner angle of each, and separated by a considerable interval. The dorsal muscles are much larger, have a convex outer and a concave inner border, and are somewhat pointed superiorly. They are more widely separated than the ventral.

The *Sabellaria saxicava*, Baird,[1] from Vancouver Island, is an allied form with similar paleæ. It is not, however, a "saxicavous" form, the sandy tube being covered over with a crust of *Melobesia*, and being lengthened as the latter increases.

This species also approaches Grube's[2] *Sabellaria* (*Pallasia*) *sexhamata* from the Philippines, but differs in the number and structure of the hooks, and also in the outline of the external paleæ. The number of the hooks is not a character of much moment, since in sections of the present species several reserve-hooks are found, and Haswell makes similar observations in regard to the allied form, *Sabellaria australiensis*.[3]

Sabellaria (*Pallasia*) *capensis* (Schmarda) (Pl. XXVA. figs. 24, 25; Pl. XXVIA. figs. 11, 12).

Hermella capensis, Schmarda, Neue wirbell. Thiere, I. ii. p. 23, Taf. xx. fig. 171.

Habitat.—Collected between tide-marks at Sea Point, near Cape Town, Africa, where it was first found by Schmarda and subsequently by Kinberg.

The largest example measures 90 mm. in length, with a diameter at its widest part of 6·5 mm. Schmarda states that his specimens were 70 mm. in length.

This form is nearly allied to the ordinary *Sabellariæ*, differing from *Sabellaria alveolata* in having only two rows of paleæ, the shape of the inner being such that it compensates for the absence of the second inner row. Schmarda describes and figures[4] the paleæ as notched at the tip, but this is hardly accurate, since the thin spathulate tip has a chitinous fold on the under surface, the end of which projects in the form of a spur directed dorsally (Pl. XXVA. fig. 24). When viewed in certain positions, as obliquely from above, the appearance of a notch is simulated by the arrangement. On the other hand, a lateral view (Pl. XXVA. fig. 25) gives a hatchet-shape to the whole organ, and the terminal spur is very prominent. The paleæ are crossed by curious transverse lines, which, especially along the convex edge, assume a wavy direction; and, moreover, a scaly aspect, apparently from wear, occurs along the same edge near the tip.

While it is possible to recognise these paleæ in Schmarda's description and figure, it is

[1] *Proc. Zool. Soc. Lond.*, 1863, p. 109. [2] Annelidenfauna d. Philippinen, p. 219, Taf. xiv. fig. 1.
[3] *Proc. Linn. Soc. New South Wales*, 1882, vol. vii. p. 634, pl. xii. figs. 7–11.
[4] Neue wirbell. Thiere, I. ii. p. 23, fig. *a*.

otherwise with the inner paleæ, for the outline of the latter, according to him, corresponds with a lateral view of the outer form just given, as a comparison of the figure will show (Schmarda, fig. *b*, p. 23).

The tip of the inner paleæ (Pl. XXVIA. fig. 11) is bluntly pointed, then it gradually expands into a large thick heel which projects beyond the somewhat slender shaft, so that the latter nearly forms the apex of a triangle, and the serrated upper or anterior edge the base. These are evidently modifications of the same type. In this case the outline resembles an attenuated leg with a long tapering foot furnished with a huge heel, the latter having the dorsal surface crenated. In one specimen an ovato-lanceolate leaf of an Alga is attached to one of the ventral paleæ, and overhangs the crown like an operculum.

A little below the bases of the outer paleæ of the crown a closely set series of conical papillæ occur. These would seem to have been in life of a deep purplish hue, a colour which more or less tinges both dorsal and ventral surfaces of the animal.

The cephalic branchiæ are numerous, about sixteen stems being visible on each side of the fork.

The mouth has the usual structure, with a somewhat long cirrus on each side of the palpi, and a tuft of finely pennate bristles a little behind.

The thoracic region has the typical three sets of bristles. The oar-shaped forms of the dorsal row have a smooth blade, which is tinted of a purplish hue distally. A high power shows only a few minute spines at the point of the most perfect examples. Schmarda gives an unsatisfactory figure of one of these (fig. *d*, *op. cit.*) with the tip broken, a condition doubtless very common. It is too wide at the extremity, and the striæ are placed too near the latter. The tip is more attenuate than in the previous species. Very few are quite symmetrical distally, and all have well-marked striæ at intervals. The intermediate bristles likewise present a more attenuate tip than in the *Sabellaria* (*Pallasia*) *johnstoni*, and are much less spinous. The ventral tufts of bristles are also smoother than in the latter form, and slightly differ in the breadth of the fusiform region at the tip.

The hooks (Pl. XXVIA. fig. 12) have seven teeth and an indistinct process. Moreover, as in many others, the teeth are in a double row, so that it is often difficult to see the hook in simple profile.

The food in the alimentary canal is composed of sandy mud, numerous sponge-spicules, a few Diatoms and organic fragments. Many Gregarinæ also occur in the intestine.

The tube is a very dense one, composed of entire small shells, coarse fragments of shells, large sand-grains, and other structures cemented together by a tough secretion which also lines the interior. The latter is deeply tinted of a dull purple hue in many parts, yet this does not prevent the lining membrane from being semitranslucent, since

the fragments of shells can be observed through it. Externally the tube is on the whole pale.

The minute anatomy of the anterior region of the body corresponds generally with that in the foregoing form. The same intricate muscular central region occurs, and it is even more regular and beautiful, especially in connection with the two median and two lateral channels in the dorsal region, after the body-wall has been completely formed, *i.e.*, behind the mouth. The nerve-cords in this part are internal, abutting on the perivisceral chamber. In the anterior third of the body the cuticle is very indistinct. The dark hypoderm is thicker dorsally than ventrally, and in the preparation it assumes a series of regular frills along the dorsum. A thick hyaline basement-layer occurs beneath the hypoderm in the latter region. The circular muscular coat is well developed. The longitudinal dorsal muscles are much more massive than the ventral, and are continuous in the median line dorsally over the vascular channel. The separate nerve-cord lies on each side of the median line amidst a series of interlaced muscular fibres within the circular coat. The sections of their bases show that the great thoracic bristles alternate with a smaller series, probably the roots of the second row. The œsophageal region of the alimentary canal is slung by muscular fibres below the dorsal vascular canal. Externally it presents a thick layer of longitudinal fibres, then a firm circular coat on which the frilled inner lining rests. Strong muscular bands connect it with the ventral wall a little within the nerve-cord on each side.

The posterior region differs considerably from that in *Sabellaria* (*Pallasia*) *johnstoni*, in the proportions of the dorsal and ventral muscles, both of which are comparatively small. The former have a slight bulbous enlargement at the external region of the dorsal arch, and then form a thin layer inward to the central line. The latter muscles appear in section as a small elliptical mass between the bristles and the nerve-cord on each side. The neural canal lies at the inner and inferior region of the nerve-cord. The circular muscular layer is well developed, but the preparation is not in a condition to show the superficial parts. The great central area of the body in this region is occupied by the distended alimentary canal, while the reproductive elements occur at the sides. A band of muscular fibres and connective tissue from the lower surface of the alimentary canal slings the ventral blood-vessel and then spreads outward to be attached between the nerve-cords.

The long caudal appendix has the cuticular and the thin hypodermic layer externally, then a delicate band of circular fibres and a more or less continuous though thin longitudinal layer. Some longitudinal fibres also appear to exist externally to the circular, indeed, the impression from the sections is that there are two thin circular and two longitudinal layers, but the state of the preparations does not warrant a decided statement. The glandular lining is firm. This part of the alimentary canal contained sand-grains and sponge-spicules.

Schmarda procured his examples at Table Bay, Cape of Good Hope.

Sabellaria (*Pallasia*) *giardi*,[1] n. sp. (Pl. XLVII. fig. 7; Pl. XXVIA. figs. 13–15).

Habitat.—Dredged at Station 163B (off Port Jackson, Sydney), June 3, 1874; lat. 33° 51′ S., long. 151° 22′ E.; depth, 35 fathoms; bottom temperature 63°·0, surface temperature 69°·0; sea-bottom, hard ground. It was found during the examination of *Aphrodita australis* deeply imbedded amongst its bristles.

The specimen is fragmentary, measuring about 7 mm. in length, and a little less than 2 mm. in diameter at its widest part.

It apparently belongs to the same type as *Sabellaria* (*Pallasia*) *johnstoni*, and thus differs from *Sabellaria* (*Pallasia*) *capensis*. It has, however, features peculiarly its own. The crown is furnished with a double row of very long brittle paleæ. The outer are thinner and more flattened than the inner. Each springs from a somewhat pointed base, gradually widens out into a broad, flat blade, finely striated longitudinally, and, again, slightly diminishes toward the tip, which is rapidly sloped to a point (Pl. XXVIA. fig. 13) and marked by a few transverse lines. In certain lateral views a few notches or serrations occur below the tip. The outer paleæ are directed forward with the tips slightly bent outward. A faint curvature is evident between base and tip.

The inner paleæ, again, are likewise directed forward, but have the tips inclined somewhat inward. They are more robust organs (Pl. XXVIA. fig. 14) than those of the exterior row, and have a fusiform shape, but less diminished inferiorly than superiorly. They are hollow, the tapering portion toward the extremity being strengthened by thicker walls, and the whole inner region marked by fine longitudinal striæ. Like the outer paleæ a slight curvature occurs between base and tip.

Along the outer base of the external row of paleæ is on each side a series of about eleven papillæ, which increase in length dorsally. The last forms a somewhat conspicuous cirrus over the dorsal hook. The latter is a pale amber-coloured organ imbedded in the tissues, the curved tip alone emerging from the surface. The hooks are thus less prominent than in the other species. The cephalic region is tinted of a pale brownish hue. Ventrally, the branchiæ arise by fewer stems than in the other species, about eight being conspicuous.

The mouth has two similar palpi, with cirri in front, but in addition it possesses at the base of the latter an outer and an inner acutely lanceolate flattened cirrus. No bristles are visible under a lens at the side of the mouth. A little behind the two last-mentioned cirri are two others below the branchiæ. It is probable that the two former are morphologically connected with the same row though they have moved forward.

The thoracic or anterior region quite differs from that of the previous form in having four rows of great dorsal bristles. These have the usual oar-shape, and are generally

[1] Named after M. Alf. Giard, author of various important papers on animals allied to the Annelida.

split and fringed at the tip from wear. The intermediate forms have very fine filiform extremities, which appear to be nearly smooth, so fine are the minute spikes. The small ventral tufts in the same region have a similar shape, the tips being much fringed. The delicate intermediate forms present also extremely elongated filiform extremities with barely discernible microscopic spikes.

The ventral bristles of the posterior region, so far as seen in the fragment, follow the same type as in the anterior region, only the more delicate series are so finely spinous toward the tip that they appear almost smooth under a power of 350 diameters. The same proportion, indeed, in this respect takes place as in the former series.

The hooks (Pl. XXVIA. fig. 15) have about nine teeth, the lowest, that next the point of attachment of the tendons, being long and distinct. The outline of the organ differs from that in either of the preceding.

The anterior third of the body-wall in section conforms for the most part to the foregoing type. The hypoderm is comparatively thin, and is best seen on the ventral surface. The dorsal muscles are somewhat pear-shaped and widely separated. Their form is preserved by an environment of fibres from the circular and oblique coats. The ventral are more extended, and have the nerve and neural canal at the inner angle. The massive part of each muscle being external, the body naturally acquires a somewhat quadrangular shape in section. The alimentary canal is firm and rounded, its position in this region being maintained by various radiate bands of fibres. Two conspicuous dorsal vessels and a median ventral are present.

The *Lygdamis indicus*,[1] Kinberg, from Banks Strait, if the interpretation of what he calls the "operculum" be correct, seems to approach the foregoing, and though it differs in the number of the "opercular" papillæ, in the tips of the paleæ and other points, the laxity of Kinberg's description must be borne in mind. The *Sabellaria lævispinis*, Grube,[2] from Ascension, is also an allied form.

Family Amphictenidæ.

The paucity of the examples of this family is remarkable, especially as the group is not confined to shallow water. The great depth (1600 fathoms) at which the species occur carries the bathymetrical range much beyond previous observations, for even in the "Porcupine" expedition the representatives of the family only reached 420 fathoms.

Considerable variety exists in regard to the number of species collected by former expeditions. Schmarda gives only one, from Australia, and none occur in Kinberg's series. Grube again has five in his Philippine collection, but none in that of the

[1] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1866, p. 350.

[2] Annelidenausbeute von S.M.S. "Gazelle," *op. cit.*, p. 542.

"Gazelle." Two common species are mentioned by Ehlers from the "Porcupine," both from comparatively shallow water, and in the Norwegian North Atlantic expedition the greatest depth at which *Cistenides hyperborea* was obtained was 263 fathoms.

Petta, Malmgren.

Petta assimilis, n. sp. (Pl. XLVII. figs. 8, 9; Pl. XXVIa. figs. 16–19).

Habitat.—Trawled at Station 147 (between Prince Edward and Kerguelen Islands), December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms; bottom temperature 34°·2, surface temperature 41°·0; sea-bottom, Diatom ooze.

A form devoid of its tube, measuring about 22 mm. in length, and with a diameter of 4·5 mm. In this respect it is well to remember that the specimen is soft and flattened.

It is a larger form than the British representative of the genus. The bright golden paleolæ are also longer and more slender, their number being about fourteen on each side, while a few of the inner are very attenuate. The triangular membranous fold under the paleolæ has an even margin. The anterior border of the first segment shows four or five well-marked fimbriæ as in the British species; and the following segment has more numerous though smaller appendages. Posteriorly the scapha has a different anal process from the species above mentioned, and the ligula is short and conical. The anal process forms a scale-like appendage to the scapha.

There are seventeen pairs of bristles, which group themselves structurally into two series. The bristles of the first series (Pl. XXVIa. fig. 16) possess stout shafts and tapering tips with a wing at each side merging toward the extremity into a double series of spikes by the splitting of the wings. These terminal serrations are much finer than in the British representative. The other series (Pl. XXVIa. fig. 17) also have a wing at each side of the terminal region, but before much diminution takes place an enlargement or heel occurs, and then the bristle rapidly tapers to a fine point. The edge of the terminal region is finely serrated, and a space below the enlargement is in the same condition.

The hook-like caudal bristles agree in arrangement with those in the British form, but they slightly differ in shape (Pl. XXVIa. fig. 18), the tip being less tapered and less hooked. Certain wavy bands are also present in all, a short distance beneath the extremity.

The hooks (Pl. XXVIa. fig. 19) very much resemble those of the British form (and also those of Malmgren's *Petta pusilla*, if we add the minute serrations probably omitted by his artist on the third process), showing superiorly a smaller upper and a larger inferior fang, followed by a broad hook-like process (the third) bearing a series of minute denticulations on its edge, and lastly a rounded base, less prominent than in the foregoing.

The contents of the alimentary canal consist of a rich greyish-white mud, in which *Globigerinæ* abound, but which likewise swarms with many beautiful Diatoms and fine

siliceous hairs, mixed with an occasional sponge-spicule or fragment of minute Crustacean. A few Radiolarians also occurred, and some seem to have been swallowed alive, or at least perfectly fresh.

Family Ampharetidæ.

The members of this family, of which an excellent résumé has been given by Grube,[1] are perhaps more abundant in Arctic and Antarctic Seas than in the warmer oceans. But at the same time no group in the Challenger series is more thoroughly abyssal, at least where the numbers are considerable. Of the fifteen representatives two-thirds come from depths ranging from 1100 to 2750 fathoms, the remaining five being found between 75 and 470 fathoms. Several forms resembling the European pass to the American shores.

The representatives of the family are not numerous in the collections of former voyagers. Thus no species is mentioned by Schmarda. Kinberg again describes a single new Patagonian *Ampharete* (*Ampharete patagonica*), in addition to finding the common *Amphicteis gunneri*. Grube has two in the Philippine collection, and he describes a new genus, *Phyllocomus*, found at the Crozets and Kerguelen in the collection of the German ship "Gazelle." None occur in his Annulata Erstediana. Ehlers found three known species in that part of the "Porcupine" collection sent him for examination, and of these *Melinna cristata* descended to 1366 fathoms. In Marenzeller's series from Southern Japan two species, viz., the European *Amage auricula*, and Grube's Philippine species, *Amphicteis angustifolia*, occur.

In some cases it has not been thought necessary to go into detail in regard to external form where correspondence with the typical species is close. Only the diagnostic features have been mentioned. It is noteworthy in connection with the latter that the hooks both of the new species in this family and in the Terebellidæ have not been figured by Wirén in his paper on the Annelids of the Vega expedition.

The closeness with which the various species of *Amphicteis* approach each other is interesting. It is often doubtful whether these be mere varieties of *Amphicteis gunneri* or new forms. The same remark also applies to others of the family.

Most of the tubes are composed of very fine mud.

Ampharete, Malmgren.

Ampharete sombreriana, n. sp. (Pl. XXVIa. figs. 20, 21).

Habitat.—Dredged off Sombrero and St. Thomas, West Indies, in 470 and 390 fathoms.

[1] *Jahrb. d. Schles. Gesellsch.*, Breslau, April 6, 1870, sep. Abd., p. 8.

A small specimen measuring about 12 mm. in length by a little more than 1 mm. in diameter at its widest part anteriorly (exclusive of the bristle-tufts). The example is considerably injured, but exhibits the chief characters fairly.

There are fourteen pairs of bristle-tufts in front, and twelve segments in the posterior region of the body furnished only with processes for the hooks. In this respect it agrees with *Ampharete arctica*, Malmgren. The *Palmula* comes nearest in appearance to the condition in *Ampharete goesi*, Malmgren, in regard to the structure of the paleolæ, which are short and broad, with a tapering filiform tip (Pl. XXVIA. fig. 20). It, however, quite differs from the latter species, which has seventeen posterior papillæ for the hooks. The paleolæ form a beautiful fan in front. In regard to the structure of the extremity of these organs, it is interesting that no form having a mucronate tip (as figured by Malmgren in *Ampharete arctica*) has yet been observed.

The branchiæ are four on each side and of the usual length and structure, except that their bases are united.

The bristles in each tuft consist of a longer series with wings, and a shorter and somewhat stouter group of the same structure, the attenuated extremities of which commonly reach the inferior margin of the wings of the longer kind. The arrangement thus differs from that in *Ampharete gracilis* from St. Andrews and other parts in which the intermediate shorter forms are very slender and devoid of an evident wing.

The uncini present six or seven teeth (Pl. XXVIA. fig. 21), according as the distal one is visible or not, and exhibit the following features when compared with other species. They do not show so many teeth as the hooks of *Ampharete grubei*, and the last tooth (anteriorly and inferiorly) is larger. They are broader than those of *Ampharete goesi*, and present the same distinction inferiorly, viz., the projection of the last fang beyond the comparatively small mucronate process, both from this form and *Ampharete arctica*. They appear to have more numerous teeth than in *Ampharete gracilis*, and besides differ in the contour inferiorly and anteriorly, as just noted in regard to the other species. On the whole they are comparatively short and broad.

The anus presents a crenate or papillose margin, with a short cirrus at each side.

The contents of the alimentary canal consisted of a fine greyish mud in which fragments of sponge-spicules and a few minute Foraminifera (*Globigerinæ*) occurred.

In section the cuticle is distinct, and the increase of the hypoderm along the ventral arch is great. The circular muscular coat is well marked. The longitudinal ventral form long and massive muscles separated by a considerable median interval, bounded on each side by the strong oblique muscles. The dorsal are much less. They extend from the bristle-bundles to the middle line. The nerve-cords, as in *Amphicteis*, lie outside the circular muscular coat, but protected by the thick hypoderm. The specimen is too soft for further minute description.

Ampharete kerguelensis, n. sp. (Pl. XLVII. fig. 10; Pl. XXVIA. figs. 22–24).

Habitat.—Dredged at Station 149H. (off Cumberland Bay, Kerguelen), January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E.; depth, 127 fathoms; surface temperature, 39°·8; sea-bottom, volcanic mud. Found amongst the debris sent from this Station.

A small species, the larger example measuring about 10 mm. in length, and having a diameter, exclusive of the bristles, of 1·5 mm. at its widest part.

The anterior fan of bristles is made up of longer forms than in the previous species, and they possess a pronounced terminal curve. In the smaller specimen each of these has a minute filiform process projecting from the somewhat blunt tip, but in the larger the majority of the longer bristles are devoid of this appendage. The paleolæ, moreover, are few in number, probably seven or eight. Each tapers very gradually from base to tip (Pl. XXVIA. fig. 22), the latter being either somewhat blunt, or provided with the filiform appendage. The convex edge in all shows a double outline, probably an indication of its homology with the winged forms of bristles, and this is especially evident in the paleolæ of the smaller example (Pl. XXVIA. fig. 23).

The shorter intermediate forms of the lateral bristles have long and slender tips devoid of any evident wing, after the type of *Ampharete gracilis* from St. Andrews.

The hooks (Pl. XXVIA. fig. 24) have six or seven teeth and a more elongate (and perhaps more typical) form than in the previous species (*Ampharete sombreriana*). The lower fang, also, does not project so much beyond the inferior process as in the latter.

Very fine mud with sponge-spicules, a few bristles of an Annelid, and some Diatoms occurred in the intestine.

The body-wall is similar to that in *Amphicteis*, and considerably thinner than in the foregoing species, probably from greater distention.

The *Ampharete patagonica* of Kinberg[1] seems to be an allied form, but the indefinite nature of the description leaves room for doubt.

Ampharete gracilis, Malmgren.

Ampharete gracilis, Malmgren, Nordiske Hafs-Annulater, p. 367, Tab. xxvi. fig. 75.

Habitat.—Dredged in the "Knight Errant," at Station 7, August 12, 1880; lat. 59° 37′ N., long. 7° 19′ W.; depth, 530 fathoms; sea-bottom, Globigerina ooze.

[1] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1866, p. 343.

Phyllocomus, Grube.

Phyllocomus crocea, Grube (Pl. XLVII. fig. 11; Pl. XXVIA. fig. 25; Pl. XXXVIIA. fig. 6).

Phyllocomus crocea, Grube, Monatsber. d. k. preuss. Akad. d. Wiss. Berlin, August 1877, p. 543.

Habitat.—Dredged at Station 151 (off Heard Island), February 7, 1874; lat. 52° 59′ S., long. 73° 33′ E.; depth, 75 fathoms; surface temperature, 36°·2; sea-bottom, volcanic mud.

A fragment of the anterior region of a comparatively large form, the greatest diameter, which is immediately behind the head, being 4 mm., and the length about 10 mm. Grube's specimen was larger and more complete, measuring 83 mm. in length by 7 mm. in breadth.

The snout is flattened and broadly spathulate anteriorly, the margin being somewhat rectangular. A shallow groove occurs in the middle line, with a slight elevation on each side. Just where the fold of the buccal segment runs forward to meet the margin of the flattened region of the snout a well-marked slit occurs on each side, and may be connected with a sensory, or, as Grube says, a secretory function. No tentacles are present in the species, and this is exceptional in the family. The next segment bears dorsally the marks of four branchial processes on each side, the two inner occurring in a transverse line, while the two outer are placed in a line running obliquely outward and forward from the foregoing. In the centre of the bases of these organs are certain small chitinous masses of an elongate-ovoid shape, resembling undeveloped spines. No trace of paleolæ is visible. Grube describes the branchiæ as broadly lanceolate, the posterior with long tapering tips, which extend considerably beyond the frontal margin.

There are fifteen pairs of bristle-bundles on each side, and their structure agrees with that usually met with in the family, viz., each possesses a stoutish shaft, with a well-marked terminal wing. The shorter series in each tuft is also stout and furnished with wings. The bristle-papillæ are less prominent than the larger hook-pads beneath, so that both are seen from the dorsum.

The hooks (Pl. XXVIA. fig. 25) possess five well-defined teeth, the middle being that most developed. The inferior fang has beneath it a small mucro, so that there is a double curve between it and the terminal process. The body of the hook is marked by bold transverse lines which pass into the bases of the three middle teeth.

The greyish mud in the alimentary canal is very rich in Diatoms, and there are also a few Radiolarians and other organisms.

A glance at the body-wall (Pl. XXXVIIA. fig. 6) in section shows that the type differs from that of any other member of the group. The cuticular and hypodermic

coats are thin, except on the lateral processes, where a considerable depth of hypoderm exists. The circular muscular layer is feebly developed all round. The longitudinal dorsal form two powerful sausage-shaped masses which have a deep symphysis in the middle line and a firm internal boundary. The ventral, again, are reniform, since the outer edge is reflected inward. A wide hiatus occurs between these muscles, the inner edges of which are bounded by the powerful oblique passing to their insertions in the circular coat outside the nerve-area. The latter lies external to the circular coat, and a round neural canal lies in the median line toward the upper border. Two capacious and much folded hollow organs lie over the area below the alimentary canal, and plaited masses occur superiorly above the latter. The ventral blood-vessel runs in the middle line below the alimentary canal. The latter is firm and brownish, the external coat consisting of a chitinous layer, on which the somewhat compact glandular tissue rests. The glands form close parallel rows, so that when viewed from the inner surface the aspect is characteristic. The granular masses and folded organs in the upper region of the perivisceral cavity are probably connected with the reproductive apparatus.

The form of the snout in this species somewhat approaches the *Sabellides angustifolia*[1] of Grube, from the Philippines, but which Marenzeller has placed under *Amphicteis*, and extended its distribution to Japan. Both this and the *Amphicteis philippinarum* of Grube have a spathulate snout.

Grube's example was procured between the Crozets and Kerguelen. The number of the anterior segments in his example was seventeen, and the posterior forty-five.

Amphicteis, Grube.

Amphicteis gunneri (M. Sars.)

Amphitrite gunneri, Sars, Beskrivelser og Jagttagelser, &c., p. 50, Tab. xi. fig. 30.

Habitat.—Trawled at Station VI. (off the Strait of Gibraltar), January 30, 1873; lat. 36° 23′ N., long. 11° 18′ W.; depth, 1525 fathoms; bottom temperature 36°·0, surface temperature 58°·0; sea-bottom, Globigerina ooze.

The specimen is small and fragmentary, but corresponds with the ordinary examples. The inferior curves of the hooks, as figured by Malmgren's artist, are slightly at variance with nature, the posterior depression being too long, while the anterior convexity is correspondingly shortened.

In the alimentary canal is a little greyish mud containing somewhat large *Globigerinæ* and a few sponge-spicules.

[1] Annelidenfauna d. Philippinen, p. 206, Taf. xii. fig. 1.

Amphicteis gunneri, M. Sars, var. *atlantica* (Pl. XXVIa. figs. 26–29).

Habitat.—Trawled at Station 63 (towards the middle of the Atlantic, between Spain and the American shore), June 19, 1873; lat. 35° 29′ N., long. 50° 53′ W.; depth, 2750 fathoms; surface temperature, 71°·0; sea-bottom, red clay.

The length of the single example is 26 mm., and the diameter (exclusive of the bristles) anteriorly is barely 2 mm.

In general appearance this form corresponds with *Amphicteis gunneri* from Europe and Canada, though the anterior fan of bristles is decidedly longer. The seventeen pairs of bristles behind the anterior fan likewise correspond in number, though perhaps the winged bristles are somewhat more slender and tapering. The number of segments (fifteen) bearing hooks posteriorly is also the same.

The anterior fan certainly appears to be longer than in either the Canadian or the British form, and its structure leans to the latter variety rather than to the former. The bristles (Pl. XXVIa. fig. 26) are long and tapering, with a decided curve at the tip, the perfect or unworn form having a long terminal filiform process. They are less attenuate in general appearance than the British variety, while they are more elongate than the Canadian. The latter tapers rapidly from the robust basal region, shows little or no curvature, and ends in a slender point, the whole bristle being comparatively short. A slight indication of a wing, moreover, occurs at each side of the tip in the Challenger form. It more resembles the Norwegian representatives of *Amphicteis gunneri* than even the British, each having characters of its own.

The hooks (Pl. XXVIa. fig. 27) approach those of *Amphicteis gunneri*, but differ slightly from the foregoing in the shortness of the dorsal margin, which also has a less evident depression (very distinct in the Norwegian forms). There are five large teeth and a rudimentary one above the inferior process.

The distinctions between the Challenger species and *Amphicteis gunneri* are not easily recognised, but they seem noteworthy. The gradation passes from the Atlantic form to the Canadian (Pl. XXVIa. fig. 28) and then to the British (Pl. XXVIa. fig. 29). The food in the alimentary canal consists of greyish mud in which numerous small *Globigerinæ*, Diatoms, and other minute structures occur.

There is little in section of the body-wall to distinguish this form from *Amphicteis gunneri*, except that the nerve-cords are less flattened.

Amphicteis sarsi, n. sp. (Pl. XLVII. fig. 12; Pl. XXVIIa. fig. 1).

Habitat.—Trawled at Station 325 (in the Atlantic, off the South American coast), March 2, 1876; lat. 36° 44′ S., long. 46° 16′ W.; depth, 2650 fathoms; bottom temperature 32°·7, surface temperature 70°·8; sea-bottom, blue mud.

The length of the injured fragment, which consists of the anterior region, is about 34 mm., and its diameter at the base of the paleolæ 3·5 mm. The species is therefore of considerable size, since the bristled region only is present.

The snout agrees in general characters with the ordinary forms, the oblique (ocular?) ridges being very prominent. The broad double eminence between the branchiæ is well marked. There are seventeen pairs of bristle-bundles. The first or paleolæ are long tapering organs, with a slight curve toward the tip, which has a trace of a wing on each side, as in allied species. This condition doubtless indicates the morphology, viz., that each group consists of one of the lateral bristle-tufts modified and directed forward. The lateral bristles behind the foregoing present a narrow wing on each side, and their extremities are long, finely tapered and curved. The wing is just perceptible on the slender intermediate forms.

The hooks (Pl. XXVIIA. fig. 1) have four or five large teeth, with a process beneath the lower one, and the curves of the terminal or anterior inferior process are characteristic. Five seems to be the most common number of teeth. In shape these hooks come nearest to the Canadian form of *Amphicteis gunneri*, and it is remarkable to notice how closely all these forms approach each other.

The specimen occupied a massive tube of dark greyish mud, lined internally by chitinous secretion. The diameter of the tube is 11 mm., and the length of the longest piece 80 mm., but part of this is less bulky than the foregoing. Here and there amongst the mud of the tube externally the same rounded ochreous arenaceous Foraminifera occur as in *Myriochele heeri*.[1] The mud, moreover, shows numerous sponge-spicules and a few Diatoms. The grains of sand forming the tests of the arenaceous Foraminifera are very minute.

The hypoderm of *Amphicteis sarsi* is moderately developed, except over the nerve-area, where it is thicker. The nerve-cords are placed somewhat deeply with regard to the surface, for the circular coat bends inward so as to cause them to bulge into the perivisceral chamber. The size of the longitudinal ventral muscles is considerable.

Amphicteis wyvillei, n. sp. (Pl. XXVIIA. fig. 2).

Habitat.—Trawled at Station 147 (midway between Prince Edward and Kerguelen Islands), December 30, 1873: lat. 46° 16′ S., long. 48° 27′ E.; depth, 1600 fathoms: bottom temperature 34°·2, surface temperature 41°·0; sea-bottom, Diatom ooze.

A form of considerable size, though not quite complete posteriorly, measuring 39 mm. in length and 3 mm. in diameter exclusive of the feet. The vicissitudes connected with its removal from so great a depth have injured the specimen.

The head agrees in general characters with that of *Amphicteis gunneri*, and the first

[1] *Vide* page 412.

series of bristles is of moderate length. These are less tapered than in specimens from St. Magnus Bay, but more slender than those from Canada and Bergen. The lateral bristles, which are seventeen in number, agree most nearly with the former. The tips differ slightly from those of *Amphicteis sarsi*.

There are fifteen hook-bearing pinnules posteriorly, but the tip of the tail is absent. The hooks (Pl. XXVIIa. fig. 2) show five teeth and a process beneath the inferior one. They seem to be comparatively minute, and their outline differs both in the dorsal curve and the anterior inferior process from that of any other known species. The closeness with which this and allied forms approach each other, and yet the fixed nature of the differences in the minute structure of the hooks, is interesting.

A pure white pulp filled the alimentary canal of the animal. Microscopically a vast number of Diatoms, Radiolarians, forked structures with a spike at the end (like the tips of the cylinders formerly described in *Maldane sarsi* (p. 393), only with a shorter spike and larger basal region), and a few small *Globigerinæ* were the chief forms observed in this rich ooze. The *Globigerinæ* appeared to be in very good condition, and were probably fresh when swallowed, the fine spines in some cases radiating all round like hairs, and the interior apparently still filled with the protoplasm. There seems to me to be no valid reason why these Foraminifera, Radiolarians, and other forms should not live on the bottom any more than the arenaceous types or the Annelid itself, concerning which no manner of doubt exists.

No trace of a tube exists in the preparation.

Amphicteis japonica, n. sp. (Pl. XXVIIa. figs. 3–5).

Habitat.—Dredged at Station 232 (south of Yedo, Japan), May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom temperature 41°·0, surface temperature 64°·2; sea-bottom, green mud.

The length of the example is about 28 mm., with a diameter in front of 2·5 mm.

In general appearance it corresponds with *Amphicteis gunneri*, having seventeen pairs of bristle-tufts in front and fifteen pairs of hook-bearing pinnules posteriorly. The paleolæ are of moderate length and nearly straight, the more slender only exhibiting a slight curvature. They differ from the corresponding organs in a typical example of *Amphicteis gunneri* from Norway (Pl. XXVIIa. fig. 4), both in regard to the character of the tapering and the general outline, which is somewhat fusiform (Pl. XXVIIa. fig. 3). They are marked by the usual longitudinal striæ. The traces of wings are less evident in these than in the Norwegian species, the bristle-tips of which are tapered to a degree of extreme tenuity. The lateral bristles present no feature of note, except perhaps that the wings are rudimentary.

A single flattened branchia (detached) accompanied the specimen, but it is doubtful whether the shape can be depended on.

The hooks (Pl. XXVIIA. fig. 5) have six teeth, with a process between the last and the anterior inferior end of the hook, which is broader than usual. The exact value of these minute differences is not perhaps fully understood, but they are noteworthy.

The food consisted of a whitish mud abounding in Diatoms, the long cylindrical rods with sharp spikes, a few small Foraminifera, and various fragments of minute Crustacea.

The animal was in a friable tube of dark greyish mud lined by a tough chitinous layer, which at one part had an ochreous tinge. Besides the mud and sand-grains, numerous sponge-spicules, Diatoms, arenaceous Foraminifera, a few small *Globigerinæ*, and an occasional *Ramulina*-like type occurred in the wall of the tube.

In structure this form corresponds for the most part with *Amphicteis gunneri*, though the nerve-cords are less flattened.

The *Amphicteis angustifolia*, Grube, as more minutely described by Marenzeller,[1] has a hook with from four to five teeth, but no process between the last and the prow of the organ. The two species, however, are closely related. Marenzeller's example came from Tokio Bay, while Grube's [2] was found at Tahitu in the Philippines.

Grubianella,[3] n. gen.

Grubianella antarctica, n. sp. (Pl. XLVIII. figs. 1, 2; Pl. XXVIIA. fig. 6).

Habitat.—Trawled at Station 156 (in the Antarctic Sea), February 26, 1874; lat. 62° 26′ S., long. 95° 44′ E.; depth, 1975 fathoms; surface temperature, 33°·0; sea-bottom, Diatom ooze.

Also procured in the trawl at Station 157 (a little farther northward in the same sea), March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; bottom temperature 32°·1, surface temperature 37°·2; sea-bottom, Diatom ooze.

A form near *Amage*, but differing in the length of the snout in front of the branchiæ, and in the form of the hooks. The length is about 60 mm., and the greatest diameter in front about 4·5 mm.

The snout forms a flat arch in front, with a prominent rim beneath which the numerous smooth tentacles extend forward from a subjacent frilled lobe. These are slightly clavate, and form a group on each side; while the longer are internal, the shorter external. A frilled process beneath assists in forming a kind of upper lip. The superior arch of the snout presents two rounded papillæ, a short distance on each side of the middle line, and a little behind the anterior margin. Between these are a pair of flat

[1] *Denkschr. d. k. Akad. d. Wiss. Wien*, Bd. xlix. p. 198, Taf. ii. fig. 5.

[2] Annelidenfauna d. Philippinen, p. 206, Taf. xii. fig. 1.

[3] Named after the late lamented Prof. Ed. Grube of Breslau, who devoted his main energies to the study of the Annelids.

ribs, wide in front and narrow behind. In one or two examples these papillæ form the anterior angles of an elevated cephalic region, the lateral boundary on each side running from the papillæ backward to the nuchal plait. The buccal region immediately behind is marked by bold transverse ridges, terminated posteriorly by a fold, just in front of the branchiæ. The latter occur in pairs, viz., two anterior, on the third segment, with the axis of insertion directed downward and backward; and two posterior, on the fourth segment, with the axis of insertion pointing downward and forward, in each case viewing from the dorsum. The tips of some are quite filamentary.

The first bristle-tuft is small, and lies just below the base of the inferior branchia of the front pair; and the next is placed similarly in relation to the second pair. There are fourteen pairs, as in *Amage*. In structure they also approach the latter, the wing at the tip of the bristle being moderately developed. Some in each tuft are shorter and more slender, a feature well marked in the first and second series.

The hooks (Pl. XXVIIa. fig. 6) commence on the sixth (fourth bristled) segment as in *Amage*. In shape they somewhat resemble those of the Terebellidæ, from their short, broad outline. They appear to have four large teeth, though more are generally seen from the fact that the second series (for they are double) come in the line of vision, then a crescentic notch and an oblique anterior inferior tubercle. The basal margin is convex. A process occurs at the junction of the latter with the posterior border. The area between the dentigerous edge and the dorsal margin is marked by coarse striæ.

Seventeen hook-papillæ occur between the last bristle-bundle and the base of the posterior enlargement; and the latter shows eight others in front of the two long filiform anal cirri.

The body diminishes in a nearly uniform manner from the anterior border to the posterior enlargement. The latter (Pl. XLVIII. fig. 2) is tumid and elongate-ovoid, the dorsum being very convex, and the ventral surface flattened. The hook-pads are confined to the latter area, and are not visible from the former. A round papilla occurs at the anus on each side of the median line inferiorly, the long tapering cirrus being external to each. The function of the peculiar anal enlargement is probably connected with the expulsion of the fæcal pellets. It is almost bulbous in profile.

The contents of the alimentary canal in those from Station 156 consisted of whitish diatomaceous ooze of a very rich description, only a few minute sand-grains and an exceptional Foraminifer being seen. The same diatomaceous ooze occurred in those from Station 157, but it also presented not infrequent evidences of Radiolarians, and large opaque globular bodies of a yellowish colour by transmitted light with an almost prismatic edge or fracture, as if made up of separate fibrous prisms, which, however, were not regular. They seemed to resemble Foraminifera. The fine hair-like spicules also abounded in the food at both Stations.

The tubes are stiff, though friable, and are formed of greyish mud, here and there in

some marked with small whitish globules, visible to the naked eye, and due to the presence of Radiolarian skeletons. The lining membrane is quite fragile. Microscopically the tubes from Station 156 presented a contrast to the food, abounding much more in coarser sand-grains, the nodular rounded bodies with prismatic walls, larger Radiolarians, sponge-spicules, and the usual diatomaceous mud. The tubes are tolerably straight. One shows a Tubularian polypary attached to its outer surface, so that it must have been tolerably free. The tubes from Station 157 are decidedly lighter in hue, being greyish-white. Under a lens they present a minutely nodular aspect, small whitish or translucent bodies and dots occurring all over, with an occasional glassy sponge-spicule projecting from the surface. The microscopical appearances are similar to the foregoing, the same kinds of Diatoms, sponge-spicules, and Radiolarians being common to both.

Such portions of the hypoderm as remain show that the layer is of considerable thickness. The nerve-cords occupy the typical portion outside the circular muscular coat, and the median space between the ventral muscles is much less than in *Amphicteis*. The proportions of the longitudinal dorsal and ventral muscles are similar to those in the latter. The great size and muscularity of the proboscis are features of note. Externally is a layer of longitudinal fibres, then a massive circular coat upon which the hypodermic lining with its somewhat thick cuticular or chitinous investment rests.

The *Amphicteis acutifrons* of Grube,[1] from Greenland, presents a somewhat produced snout and two dorsal papillæ, but there the resemblance ceases.

The genus *Otanes* of Kinberg[2] is characterised by having only four leaf-like branchiæ in two rows, but in this form the bristle-tufts go to the posterior end of the body.

Grubianella antarctica, n. sp., var.? (Pl. XXVIIa. fig. 7).

Habitat.—Dredged at Station 158 (in the Southern Ocean), March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms; bottom temperature 33°·5, surface temperature 45°·0; sea-bottom, Globigerina ooze.

This is a much smaller specimen than the foregoing, but in other respects it seems to be similar. Unfortunately it has been dried, so that only an imperfect examination can be made. The hooks show a slight difference (Pl. XXVIIa. fig. 7), since only three teeth are visible in profile, and the outline of the anterior inferior process and other parts diverges. So far as the hooks are concerned, therefore, this form may be regarded as distinct, but in the absence of a more complete specimen it will suffice simply to mention these facts.

The alimentary canal contained diatomaceous mud, in which many *Globigerinæ* of all sizes, but only one or two Radiolarians, occurred.

[1] *Archiv f. Naturgesch.*, 1860, p. 109. [2] *Öfversigt k. Vetensk.-Akad. Förhandl.*, 1866, No. 9, p. 347.

Samythopsis, n. gen.

Samythopsis grubei, n. sp. (Pl. XLVIII. fig. 3; Pl. XXVIIa. fig. 8).

Habitat.—Trawled at Station 298 (off the American coast, south of Valparaiso), November 17, 1875; lat. 34° 7′ S., long. 73° 56′ W.; depth, 2225 fathoms; bottom temperature 35°·6, surface temperature 59°·0; sea-bottom, blue mud.

A form of moderate size, measuring about 28 mm. in length, and having a diameter of 2·5 mm. at its widest part in front. The spirit had not reached the specimens very thoroughly, since they were enclosed in their tubes.

The cephalic lobe is subquadrangular, with a prominent papilla at each angle anteriorly. Numerous smooth tentacles occur beneath the frontal lobe, and in one specimen very much longer tentacles are present in the middle line; and it is possible others exist in the perfect animal. The mouth opens immediately below the latter, at the anterior border of the narrow cephalic region, which has before it the frontal arch, then the cephalic lobe with two ridges posteriorly. The cephalic region is separated from the rest of the body, both dorsally and ventrally, by a prominent nuchal fold, which is notched on each side in front of the first bristle-tuft. The dorsal surface of the body is convex throughout, the ventral flattened anteriorly, and grooved posteriorly. In addition, the anterior (or thoracic) region, *i.e.*, the division bearing the bristles, is marked by prominent, thickened ridges, somewhat lighter in colour than the rest of the body. There are seventeen pairs of bristle-bundles, the first being considerably elongated. The wings of the bristles are feebly developed, and the tip is slightly curved and finely tapered.

As in *Samytha* the uncini commence on the fourth bristled segment, and extend to the tip of the tail. In front the pads occur below the setigerous processes, and behind the transverse thickened bands which characterise the anterior region. In the posterior division they are situated at the base of the long cirri peculiar to this part. Above the latter is a short dorsal process. The crown of the hooks (Pl. XXVIIa. fig. 8) is elongated, and the dental edge shows six teeth, the inferior being considerably larger than the adjoining. A prominent intermediate process occurs between the last tooth and the anterior inferior projection. In its general outline the hook approaches that of *Amphicteis*, especially in the marked inflection of the dorsal margin, but it more closely resembles *Samytha* in dentition.

The cirri along the posterior region are characteristic. Just before the anal enlargement is reached they become considerably shorter, and the first on that region is short, flattened, and somewhat clavate in outline, while the second is almost globular. They are absent in the other segments. A short and slightly tapered cirrus occurs on each side

of the somewhat truncate extremity of the body. In all there are about five segments in front of the anal styles.

The ventral groove in the posterior region is pronounced, a feature partly due to the great muscularity of the lateral margins. The appearance, indeed, recalls that seen in the Opheliidæ, and probably is dependent on the same structural cause.

The three branchiæ have been lost, but they seem to have occupied the usual position in *Samytha*.

The dusky greyish mud in the intestine is by no means rich in organisms. Only a few Diatoms and Radiolarians, with fragments of sponge-spicules, are visible.

The tubes are dark greyish, and friable externally, but internally have a tough translucent lining membrane. Microscopically even fewer organisms occur than in the contents of the alimentary canal. A large proportion of comparatively coarse grains of sand and fragments of sponge-spicules, with here and there a Diatom or the reticulated skeleton of a Radiolarian, comprise the forms noted.

The specimens unfortunately are not in a satisfactory state for minute investigation. On section the arrangement of the hypoderm agrees with that in the typical form, being thickest ventrally. The longitudinal ventral muscles are separated by a space as large as in *Amphicteis*. The oblique are powerful.

Verrill[1] describes a new genus, *Samythella*, in which the bristle-bundles are fifteen pairs.

Eusamytha, n. gen.

Eusamytha pacifica, n. sp. (Pl. XLVIII. fig. 4; Pl. XXVIIA. fig. 9).

Habitat.—Trawled at Station 241 (in the Pacific, off Japan), June 23, 1875; lat. 35° 41′ N., long. 157° 42′ E.; depth, 2300 fathoms; bottom temperature 35°·1, surface temperature 69°·2; sea-bottom, red clay.

A specimen measuring 33 mm. in length, with a diameter of 2·5 mm. at its widest part, anteriorly.

This form seems to be intermediate between *Samytha* and *Amage*, having the six branchiæ of the former, and the type of hooks approaching the latter. It differs from both in possessing fifteen pairs of bristles.

The frontal margin is smooth and somewhat truncated anteriorly, and superiorly is also smooth, from the margin backward to the base of the branchiæ, in front of which a transverse furrow occurs. Beneath the former lobe a dense series of somewhat long tentacles overhangs the mouth, the adherent mass extending about two-thirds the length of the branchiæ. The latter apparently spring as usual from the third

[1] *Amer. Journ. Sci. and Arts*, vol. v. p. 98.

and fourth segments; the middle one, so far as the condition of the specimen is reliable, being posterior (on the fourth segment). The tips of the organs are not much tapered.

The body presents the ordinary thickened ridges ventrally in the bristled or anterior region, the first being largely developed. There are fifteen pairs of bristle-bundles, the first with the four or five following occurring under the posterior branchia, which is small. The bristles have the usual wing, with, however, a long tapering extremity beyond it.

Each hook (Pl. XXVIIa. fig. 9) is comparatively large, and has five teeth, which approach each other in size, the first and last, however, being less than the three median. The inferior fang, which in the majority of the allied forms is largest, is of moderate size and less acute than the others. Below it is an acuminate spike with a broad base; and the anterior inferior process is somewhat pointed. The dorsal line is short and deeply incurved in the middle. The basal margin, again, has a convexity so slight that it appears almost straight till it approaches the curvature at the anterior inferior process.

About thirty-one segments occur behind the last bristle-bundle, besides the anal or terminal, though the specimen is somewhat injured in this region. Each somite bears only the processes for the hooks. The lateral muscular bands alluded to in the former species are very distinct.

The intestine contains a little greyish mud, which shows a few Diatoms and fine siliceous needles.

The tube is composed of minute sand-grains, small arenaceous Foraminifera, fragments of Radiolarians and sponge-spicules, with other minute organisms, the whole having the colour of sand with a few pale spikes. The opalescent lining-membrane is easily torn.

The body-wall is too soft for complete examination, but in section the hypoderm presents the average development, and the flattened nerve-cords occur below the somewhat wide area between the longitudinal ventral muscles. A slight interval separates the longitudinal dorsal muscles. The other points conform to the typical structure. The perivisceral cavity contains abundant male elements.

An empty tube was trawled at Station 244, June 28, 1875; lat. 35° 22′ N., long. 169° 53′ E.; depth, 2900 fathoms; bottom temperature 35°·3, surface temperature 70°·5; sea-bottom, red clay. It probably belongs to an allied form, and is decidedly tougher than the foregoing. The greyish-brown mud on the tube contains Diatoms, minute Foraminifera, the same triradiate Radiolarian formerly seen, as well as others, fragments of sponge-spicules, and minute sand-grains.

Melinna, Malmgren.

Melinna maculata, Webster (Pl. XXVIIA. figs. 10–12).

Melinna maculata, Webster, Ann. Chætop. of the Virginian Coast (separate copy), Trans. Albany Institute, January 1879, p. 61, pl. x. figs. 145–147.

Habitat.—Dredged off Sombrero and St. Thomas, West Indies, in 470 and 390 fathoms.

Two friable and broken fragments of the anterior region of a small *Melinna* having a diameter of about 1·5 mm. at the wide anterior region.

So far as the imperfect examples show, the head and anterior region agree with the typical form (*Melinna cristata*), but their condition does not warrant a description of other than the hard parts.

The structure of the isolated dorsal hook (Pl. XXVIIA. fig. 10) placed on each side behind the branchiæ is diagnostic when compared with *Melinna cristata* from Norway, or *Melinna elisabethæ*, which is not uncommon in the stomachs of haddocks caught off St. Andrews Bay. This chitinous hook is short, with a stout fibrous shaft, tapering superiorly, while the pointed and more solid tip is somewhat stiffly bent, very nearly at a right angle to the shaft. The extremity is composed of hard structureless chitin, and a thicker layer of the same nature passes downward on the anterior aspect of the shaft. On the other hand, the whole appearance of the hook differs in *Melinna cristata* from Norway (and Malmgren's artist has certainly laboured under a slight misapprehension if he had the hook of this species before him), especially in the form of the tip, which is pierced toward its dorsal margin by a perfect canal, as if for the transmission of a poisonous fluid. The *Melinna* from St. Andrews, again, has a much broader shaft, and a larger and more solid hook at the tip, the curve made by the latter forming a segment of a circle, and therefore the angle of the inner border of the arch is much less than a right angle. The circular striæ on the neck of this form are also characteristic.

The wings at the tips of the bristles of the West Indian form (Pl. XXVIIA. fig. 11) are also proportionally broader than in *Melinna cristata*.

The ventral hooks (Pl. XXVIIA. fig. 12) are likewise as diagnostic as the preceding organs. Each has a series of four teeth, which increase in size from above downward, followed by a less developed tooth, with a broad base above the anterior inferior process. The latter tooth in some bears traces of its homology with the rudimentary process often present in the gap above the inferior projection. The dorsal margin of the hook has a distinct inflection a little above the base, while the latter is evenly convex from the posterior angle forward to the base of the anterior process.

Both in *Melinna cristata* and the species from St. Andrews the hooks have a much shorter form (from base to apex), and only three teeth occur above the modified inferior one.

The pale contents of the alimentary canal presented numerous sand-grains, whitish globular bodies spinous all round, Diatoms, fragments of sponge-spicules, minute Foraminifera with a few larger *Globigerinæ*, and an occasional fragment of a Radiolarian.

Webster describes the living specimens as having green branchiæ with a red centre and narrow transverse white bands, whereas the tentacles are of a light flesh colour. The body is also flesh-coloured, sometimes tinged with green, and with numerous flake-white specks on the anterior dorsal surface. The posterior nine or ten segments are dark brown or black. There are eighteen anterior somites with setæ, and fifty-three posterior. The first three setigerous segments have a narrow white band.

Webster observes, "this species is certainly closely related to *Sabellides* (*Melinna*, Malmgren) *cristata*, but probably not the same." His doubts will be somewhat allayed when it is mentioned that the Challenger species was discriminated as *Melinna sombreriana* a year or two before the publication of his paper, and with the Norwegian and other European species in proximity. The figure of the ventral hook by Malmgren's artist is more accurate than that of the Fauna Littoralis Norvegiæ, but the representation of the nuchal hook is misleading. A comparison of the figures in Mr. Webster's paper (pl. x. figs. 145–147) with those connected with the Challenger specimen will show that a margin must be allowed for artistic variations.

The genus *Œorpata* of Kinberg,[1] and its single example *Œorpata armata*, from the Gulf of Guaiaquil, seems to be very closely related to *Melinna*.

Melinna armandi, n. sp. (Pl. XLVIII. fig. 5; Pl. XXVIIA. figs. 13, 15).

Habitat.—Trawled at Station 168 (west of the North Island, New Zealand), July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature 37°·2, surface temperature 57°·2; sea-bottom, blue mud.

A form of some magnitude, the body measuring about 45 mm. in length, and having at its wide anterior margin a diameter of fully 3 mm.

In general appearance it resembles a large *Melinna cristata*, M. Sars, though in one evident character it widely diverges, viz., in the number of the denticulations of the fourth setigerous segment. Instead of having about fourteen, as in the former case, the new one has only eight, and they are proportionally much larger. The nuchal hooks situated behind the base of the branchiæ are much stouter and the tip shorter (Pl. XXVIIA. fig. 13), though unfortunately no complete example is available for illustration, a broken fragment only being present on one side. A careful comparison with the same organ in *Melinna cristata* (Pl. XXVIIA. fig. 14) shows that the new form has

[1] *Op. cit.*, 1866, p. 347.

a much shorter and proportionally broader hook at the tip. Both have the duct perforating the tip. The shaft of the new species is also much shorter and thicker than the Norwegian, indeed it approaches in this respect the Canadian form. The duct or groove seems to be due to a splitting of the dorsal margin of the hook, and it appears sometimes to be incomplete at the extremity. The bristles are decidedly longer in the new form and the tip more attenuate. The wings in both species are narrow.

The hooks of the two species, as might be expected, are very closely allied, yet in the general outline of each there is sufficient to distinguish them. The hook in the new form (Pl. XXVIIA. fig. 15) is more elongated from the crown to the anterior inferior angle than in the Norwegian (Pl. XXVIIA. fig. 16), some of the uncini, indeed, showing four teeth above the supra-mucronal one instead of three as in the figure. The curvature of both base and dorsum is also diagnostic; and the flexures at and above the anterior inferior process (or mucro) are dissimilar. The respective figures best demonstrate distinctions which are difficult to explain concisely.

Posteriorly forty-two or forty-three segments occur between the last bristle-bundle and the anus, so that the region is comparatively long and tapered, though apparently shorter than in *Melinna cristata*. The anus appears to be a simple wide funnel, and no cirri are present in the specimen.

The example is somewhat soft and the hypoderm rather incomplete. It seems, however, to have considerable depth ventrally. The circular coat is moderately strong. The longitudinal ventral muscles are massive and convex inferiorly, while the dorsal are somewhat extended. The nerve-cords agree in position with those of *Amphicteis*.

Melinna pacifica, n. sp. (Pl. XLVIII. fig. 6; Pl. XXVIIA. fig. 17).

Habitat.—Trawled at Station 246 (nearly in Mid Pacific, in a line between Japan and San Francisco), July 2, 1875; lat. 36° 10′ N., long. 178° 0′ E.; depth, 2050 fathoms; bottom temperature 35°·1, surface temperature 73°·0; sea-bottom, Globigerina ooze.

The specimens were all enclosed in their tubes, and thus were imperfectly preserved, the spirit not having penetrated sufficiently before softening occurred. The size is variable, the longest ranging from 45 to 50 mm., with a diameter at the thick anterior region of fully 3 mm., exclusive of the bristles.

The contrast between the head of this form and that of the Norwegian *Melinna cristata* is striking, from the great development of the large, club-shaped, and elongated tentacles, which, when *in situ* in the tube, are folded in front of the snout and beneath the branchiæ. They are grooved, and, in the preparation, crenate; and evidently are capable of great extension. Their bases, as in the common form, are

covered by a large flap in front of the mouth. The latter is borne upon a proportionally larger buccal process than in the Norwegian form. Just behind the anterior margin of the snout, in front of the branchiæ, are two long and somewhat crescentic bands of pigment-specks. These are probably rudimentary eyes.

The branchiæ correspond with the typical arrangement. No dorsal hooks are visible behind these, and since four examples are in this condition, it is possible they are absent in this species. The denticulations on the dorsal edge of the fourth segment are more filiform than in *Melinna cristata*.

The bristles agree in arrangement and appearance with those of the latter species, but microscopically present greater tenuity at the extremities, which form very fine, slender processes. On the prominent ridge on each side of the fimbriated row is a dense group of simple bristles, and two similar tufts in front of it, as in *Melinna cristata*.

The hooks (Pl. XXVIIa. fig. 17) somewhat resemble those of *Melinna cristata*, from Norway, and, indeed, it would be difficult to point out any single feature that would be wholly diagnostic. The basal region in the new form, however, is decidedly more massive. A minute comparison also reveals that the curve below the third or great tooth, and that below the fourth or accessory fang, differ from those in *Melinna cristata*, the former curve being smaller, the latter larger in the abyssal form. The posterior hooks do not differ to any material extent.

The greyish mud in the alimentary canal contained numerous Diatoms, often like the other organisms coated with the very fine mud, rounded, trilobate, and other Radiolarians, fragments of arenaceous Foraminifera, and broken sponge-spicules, including a remarkable form possessing lateral processes with divided extremities.

The tube is composed of an exterior investment of very fine greyish-brown mud lined by the usual chitinous secretion. It is rather friable. One end is enlarged and apparently almost closed, a deposit of semifluid mud generally being found internally. The diameter of the tube varies from 5 to 7 mm. Microscopically the same structures occur in the very fine mud of the tubes as in the food, with the exception that the Foraminifera here and there are larger, and that on the whole the field is less rich in organisms. The Radiolarians are enveloped in an investment of mud, which is so fine that the slightest movement of the tube in the spirit causes opacity.

Melinnopsis, n. gen.

Melinnopsis atlantica, n. sp. (Pl. XXVIIa. fig. 18).

Habitat.—Dredged at Station 44 (off Chesapeake Bay, North America), May 2, 1873; lat. 37° 25′ N., long. 71° 40′ W.; depth, 1700 fathoms; bottom temperature 36°·2, surface temperature 56°·5; sea-bottom, blue mud.

A comparatively large form, the fragments measuring about 35 mm. in length, and having a diameter anteriorly of 3 mm. The specimen is so softened that a detailed description would be unsafe.

The snout does not seem to be much produced in front, but it is injured and the proboscis protrudes. The branchiæ are four in number, and are arranged somewhat as in *Melinna*, a slight ridge apparently running backward from the posterior pair. They seem to be proportionally shorter than in *Melinna*. No dorsal hooks are visible.

There is a somewhat triangular space behind the bases of the branchiæ on the dorsum, but no trace of the fimbriated and free edge of the fourth bristled segment, as in *Melinna*. The arrangement of the lateral regions resembles that in the latter form. Fourteen pairs of bristle-bundles occur on each side. These are somewhat shorter than in *Melinna*, with finely tapered tips.

The uncini (Pl. XXVIIa. fig. 18) most nearly approach those of *Melinna*, an interesting fact, for the number of the bristle-bundles and the arrangement of other parts diverge, moreover, in the new form the fimbriated border of the fourth bristled segment is wholly absent. In the hook the general outline is similar, but there are three teeth above the great fang in most cases, and the curvatures of the accessory fang and the anterior inferior process differ.

The greyish mud in the intestine showed a few *Globigerinæ* and other Foraminifera, Diatoms, and fragments of minute Crustacea.

The tube forms a somewhat stiff cylinder, having a chitinous lining of the usual character, coated externally with fine greyish mud, in which are many Foraminifera. Moreover, since numerous examples, such as *Polystomella*, of the latter have only their edges projecting, a peculiarly granular condition of the surface is caused.

Family Terebellidæ.

The number of species and varieties procured in the Challenger Expedition seems to be greater than in any former voyage. Thus Schmarda describes fourteen species (one of which is doubtful), and the majority of these are littoral forms. The *Sabellides oligocirra* of this author appears to be allied to *Thelepus*, and so with his *Terebella macrocephala*. Kinberg gives twenty-three, one or two of which had previously been known. Grube in the collection of the "Gazelle" mentions seven, and in the Philippine Annelids sixteen. Four occur in his Annulata Oerstediana. In the collection made by the "Porcupine," Ehlers found six species, and of these one (*Amphitrite*) came from a depth of 1380 fathoms.

The number requiring separate notice in the Challenger collection is about thirty-six, and several of these are of very great interest. The fine distinctions, moreover, existing

between many closely allied forms, yet the apparent stability of the characters, is another feature of note. This is especially observed in regard to the hooks, which play an important part in discrimination. The species of *Artacama* and *Terebellides* may be instanced as examples.

The representatives of the new genus *Eupista* all come from very great depths, and the condition of the branchiæ is interesting in connection with the habitat. The diminished branchiæ of *Pista mirabilis* are also noteworthy in this respect.

The new genus *Euthelepus* is intermediate between the Ampharetidæ and the Terebellidæ. The branchiæ resembling those of the former, the hooks those of the latter. One species of this genus comes from the great depth of 2160 fathoms.

Claparède[1] gives some excellent observations on the family, especially concerning the arrangement of the hooks. The recent paper on the Terebellidæ of the Adriatic by Marenzeller,[2] also, is most creditable both on account of his wide knowledge of the subject and the mode in which he utilises the parts best procured in Museums (viz., hooks and bristles) as well as the accuracy of the illustrative figures. It will be most useful in faunistic work.

Amphitrite, O. F. Müller.

Amphitrite kerguelensis, M'Intosh (Pl. XLVIII. fig. 7; Pl. XLIX. fig. 1).

Amphitrite kerguelensis, M'Intosh, Ann. and Mag. Nat. Hist., ser. 4, vol. xvii. p. 321, 1876.
Amphitrite kerguelensis, Grube, Monatsber. d. k. preuss. Akad. d. Wiss. Berlin, August 1877, p. 511.
Amphitrite kerguelenensis, M'Intosh, Zool. Kerguel., Trans. Venus Exped. *Phil. Trans.*, vol. 168, p. 260, pl. xv. fig. 13 (hook).

Habitat.—Numerous fine specimens were dredged at Station 149 (Kerguelen), January 9, 1874; lat. 49° 8′ S., long. 70° 12′ E.; depth, 20 fathoms; sea-bottom, volcanic mud. Also at Station 149c, January 19, 1874; lat. 49° 32′ S., long. 70° 0′ E.; depth, 60 fathoms; sea-bottom, volcanic mud: and at Station 149g, January 29, 1874; lat. 48° 50′ S., long. 69° 18′ E.; depth, 110 fathoms; surface temperature 40°·2; sea-bottom, volcanic mud.

The length of a fine example is about 150 mm., and its breadth anteriorly is 9 mm.

This form was first found in Royal Sound, Kerguelen, by Mr. Eaton, during the Transit of Venus Expedition, and described as above noted. It is a large species, and apparently abundant at Kerguelen. Like *Amphitrite cirrata*, O. F. Müller, this has seventeen pairs of bristle-tufts.

Four lateral lobes occur in the cephalic region (Pl. XLVIII. fig. 7), viz., the anterior

[1] Annél. Chétop., p. 385. [2] *Sitzungsb. d. k. preuss. Akad. d. Wiss.*, Bd. lxxxix. p. 151, 1884.

ventral lobe, a large lamellar process in front of and beneath the first branchia, a conspicuous fan-shaped lobe under the second, and lastly, an elevated fold running from the root of the third branchia downward. The latter is diagnostic when compared with *Amphitrite cirrata*. The long branchiæ spring from three short, graduated trunks on each side, the posterior being the longest.

A prominent papilla occurs below each setigerous tubercle in the first six segments, and a similar process below the second branchia. The ventral surface of the somites bearing the first and second branchiæ presents somewhat undefined glandular scutes, that bearing the third branchia has a distinct though narrow scute, while the ten following bear fully formed scutes.

The muddy contents of the intestine showed numerous Diatoms, sponge-spicules, fragments of minute Crustacea, minute ova, and many sand-grains. Some from Royal Sound again, besides the latter Diatoms and sponge-spicules, presented peculiar pointed conical bodies like Radiolarians, and fragments of Polyzoa.

In section the nerve-cords occupy the typical position, viz., external to the circular muscular coat, and are therefore hypodermic. They are somewhat ovoid in shape, and have a fibrous external boundary. A minute neural canal lies in the middle line superiorly between the cords. The strong oblique muscles are inserted on each side at the external boundary of the area. A thin stratum of longitudinal fibres occurs above the circular coat in the somewhat wide interval between the longitudinal ventral muscles. The wall of the alimentary canal appears to be less rigid than in the Ampharetidæ, though the structure is similar.

Grube's *Amphitrite vigintipes*[1] has hooks somewhat similar in shape, but there are from twenty to twenty-two bristle-bundles. It occurs in the Red Sea, and ranges, according to Marenzeller,[2] to Japan.

Terebella, Linnæus.

Terebella crassicornis, Schmarda ? (Pl. XXVIIA. fig. 19).

Terebella crassicornis, Schmarda, Neue wirbell. Thiere, I. ii. p. 43, figs. *a*, *b*, and *c*, 1861.

Habitat.—A fragment of the posterior region of a large *Terebella* from the tidal region, Bermuda, June 1873. The longest piece measures 70 mm., and the greatest diameter is 6 mm.

The hook-bearing pinnæ present the ordinary structure. The uncini (Pl. XXVIIA. fig. 19), which are the only organs of much diagnostic value in the softened specimen, approach those figured by Schmarda from Jamaica (*Terebella crassicornis*), and have a

[1] Anneliden des rothen Meeres, *op. cit.*, p. 29 (sep. Abd.). [2] Südjapan. Annel., *op cit.*, p. 199, Taf. i. fig. 1.

remarkably elongated base. A single hook appears above the great fang in profile, and a series of striæ on the body of the organ. The anterior inferior angle of the hook is greatly produced.

The intestine is filled with coral sand containing Foraminifera, sponge-spicules, Ostracoda, fragments of Polyzoa, and a few ova of Nematoids.

Terebella grubei, n. sp. (Pl. XLIX. fig. 2; Pl. XXVIIA. fig. 20).

Habitat.—Trawled in 120 fathoms, off Twofold Bay, Australia, April 1874.

A fragment of the anterior region of a small specimen, measuring 17 mm. in length by 1·5 mm. in breadth.

In general appearance this form somewhat resembles the *Terebella nesidensis*, D. Ch. (*Terebella danielsseni*, Mgrn.), of northern waters. The folds about the mouth are similar, and a well-marked series of ocular specks exists behind the frontal collar. These madder-brown points are in two rows, an anterior of larger and a posterior of smaller specks. Moreover, in the middle line four eyes occur in a hiatus in the row, viz., two large anterior, separated by an interval, and two smaller posterior, further apart, and therefore somewhat exterior to the former. The arrangement, which is irregular, quite differs in *Terebella nesidensis*, D. Ch., the anterior, however, being the larger. The stalks of the branchiæ are longer than in the European form, and their branches less numerous, but they show the same disparity in size between the first and the third. The stem in the first splits up into two main divisions which branch into others ending in very short ramuscles. The ultimate branches are longer in *Terebella nesidensis*, D. Ch. The ventral scutes are fifteen (the last being sunk in the ventral groove), so that there is little difference between the two forms in this respect. The same may be said of the structure of the bristles, which, however, are fewer in each tuft in the Challenger form.

The uncini, again (Pl. XXVIIA. fig. 20), while approaching those of *Terebella nesidensis*, D. Ch. in general form and even in the curves and processes, differ in possessing only a single hook above the great fang, and in minor details.

The greyish sand in the alimentary canal shows no Diatoms and only a few Foraminifera. Grains of sand and fragments of sponge-spicules are the most conspicuous structures.

The hypoderm in the ventral region is greatly developed, thus forming a thick covering for the nerve-cords. Whether this condition of the hypoderm be partly due to the mode of preservation is a moot point. The cords are rounded and closely approximated. The circular muscular coat bounds them internally, and the oblique muscles are inserted just beyond their outer borders.

The hooks of this form somewhat resemble those of the *Polymnia congruens* of Marenzeller[1] from Southern Japan.

Terebella kermadecensis, n. sp. (Pl. XXVIIA. fig. 21).

Habitat.—Dredged at Station 171 (a little north of the Kermadec Islands), July 15, 1874; lat. 28° 33′ S., long. 177° 50′ W.; depth, 600 fathoms; bottom temperature 39°·5 C., surface temperature 66°·5; sea-bottom, hard ground.

An incomplete example of a small species, measuring 14 mm. in length, and with a diameter anteriorly of 1 mm.

The tentacles still retain a faint brownish hue at the tip. Only a single branchia, apparently the first, lies at the base of the tentacles. It has a basal stem of considerable length and various branches with very short terminal divisions. The anterior bristles have a very rudimentary wing.

The hooks (Pl. XXVIIA. fig. 21) have about three teeth above the great fang, the points of the two distal being closely applied to the third. The tip of the process below the great fang approaches the latter, and the concavity between it and the anterior inferior projection is pronounced. A slight heel occurs near the base of the dorsal line.

Coarse sand, amongst which are a few Foraminifera, and rarely a fragment of a Radiolarian or a Diatom, occurs in the alimentary canal.

The specimen was enclosed in a somewhat delicate hyaline tube sparsely studded with rather large quartzose particles, gneiss, schistose fragments, *Globigerina*, and other Foraminifera and sponge-spicules. Moreover, a minute polyzoon of a somewhat fusiform outline, with an expanded oval rim out of which tentacles protrude, also occurred on the translucent wall. The zoœcium presents a lateral row of fine spines on each side of the dorsum.

Terebella (*Lanice*) *flabellum*, Baird (Pl. XLIX. fig. 3; Pl. L. fig. 1; Pl. XXVIIA. fig. 22).

Terebella flabellum, Baird, Journ. Linn. Soc. Lond., vol. viii. p. 157, pl. v. figs. 1, 2, December 1864.

Habitat.—Dredged at Station 144A, off Marion Island, December 26, 1873; lat. 46° 48′ S., long. 37° 49′ E.; depth, 69 fathoms; surface temperature 41°·0; sea-bottom, volcanic sand. Off Prince Edward Island (tube attached to *Terebratula*), in 150 fathoms. Also trawled off Twofold Bay, Australia, in 120 fathoms.

[1] Südjapan. Annel., *op. cit.*, p. 207.

Dr. Baird's tubes (for he only describes the tubes) were collected during Sir J. Clark Ross' Antarctic expedition, two coming from Narçon Island.

In size and external appearance this form bears a general resemblance to *Lanice conchilega*, Pallas, though the following distinctions are evident. The branchiæ are smaller and much less finely ramose than in *Lanice conchilega*. The whitish glandular lateral band is somewhat narrower than in the latter, and the ridges bearing the hooks in front are considerably shorter. Both forms have seventeen pairs of bristle-tufts, the only difference being the somewhat shorter winged region in the foreign species.

The hooks (Pl. XXVIIa. fig. 22) present a general resemblance to those of *Lanice conchilega* in the length and erectness of the upper region, but they differ in the relative proportions of the teeth above the great fang, in the outline of the dorsal curve (which in the foreign species has a well marked outward bend at the base), and in the larger and longer appendage of this region. The condition of the latter process, again, affects the ventral curve just as the larger process at the anterior inferior angle modifies that region. In the middle of the curve beneath the great fang a prominent process projects, whereas none exists in *Lanice conchilega*. The minute points (a kind of microscopic shagreen) along the basal region of the hook are less developed than in the latter species.

The food of this form consisted of a whitish pulp rich in Diatoms, Radiolarians, the long siliceous cylinders with pointed ends, and a few Foraminifera and fragments of sponge-spicules.

As Dr. Baird states, the diameter of the tubes (Pl. L. fig. 1) is about that of an ordinary goose-quill somewhat narrowed toward the remarkable fan-shaped expansion. The tube is composed of a tough chitinous secretion strengthened externally by fragments of shells, calcareous polyzoa, tubes of Annelids, and other debris. Its aperture is turned over in the form of a broad frill, widest in the middle, and is likewise formed of the yellow chitinous secretion stiffened by a few calcareous fragments. The lip of this process so bends round the tube that only the stalk or pillar of the fan is not embraced by it. The stem supports a wide fan consisting of a broad basal region, from the outer side of which a series of filaments proceed, and the majority of these divide dichotomously. In structure the fan agrees with the tube, the long and somewhat stiff chitinous processes being strengthened with sponge-spicules and other linear objects in an ingenious manner, while others present numerous minute grains of sand, ranged along the filaments. One end of the tube is either sunk in sand or attached to stones, shells (*e.g.*, *Terebratula*), and other structures.

The absolute identity of this with Dr. Baird's is of course open to doubt, since he had no animal. It is probable, however, that they belong to the same form.

The tube now in the British Museum was found at Narçon Island as above mentioned.

Terebella (*Lanice*), tube only.

Habitat.—Dredged at Station 76 (off the Azores), July 3, 1873; lat. 38° 11′ N., long. 27° 9′ W.; depth, 900 fathoms; bottom temperature 40°·0, surface temperature 70°·0; sea-bottom, Pteropod ooze.

Only the tubes of this form were met with. These are a little longer than a crow-quill, and composed of the usual chitinous secretion strengthened by *Globigerinæ* and other Foraminifera, minute fragments of shells and mud. The extremity presents a remarkable expansion, having the outline of a spade or rather two spades (for the expansion is double), with a series of long filamentous processes projecting from the free margins. The flattened expansions have the same composition as the tube, and the processes consist of the usual secretion with fine sponge-spicules at intervals.

This species is probably a *Lanice*, but nothing further can be said of it in the absence of the occupant.

Terebella (*Lanice*) *seticornis*, n. sp., tube only (Pl. XLIX. fig. 4).

Habitat.—Trawled at Station 322 (off the mouth of the Rio de la Plata, South America), February 26, 1876; lat. 35° 20′ S., long. 53° 42′ W.; depth, 21 fathoms; surface temperature, 71°·5; sea-bottom, sand and shells.

This is a small tube (about 1·5 mm. in diameter) attached to a group of *Modiolariæ*, or rather both tube and mollusks are connected by the byssi. The chitinous wall of the tube is coated with rather large fragments of sea-worn shells. The aperture presents a ventral tongue-shaped flap, somewhat longer and narrower than in *Lanice flabellum*. The dorsal edge has a thickish pillar supporting the base of a fan split into a dozen primary filaments, which usually become bifurcate after a short course. The lobe and fan are composed of the ordinary tough secretion, in which grains of quartzose sand are neatly imbedded; and as these are necessarily almost linear in arrangement in the filaments, a somewhat moniliform appearance is produced. The attenuated tip of each filament is formed by a thread of the secretion strengthened here and there by spicules of sponges and bristles of Annelids. The extremity is occupied by a single long winged bristle with the tapering tip at the point, while another parallel with it a little lower down gives the region due stiffness. Moreover, so transparent are many of the fragments in the filaments that the outlines of the Diatoms on their surfaces, to which they are probably attached by the secretion, are quite distinct.

Loimia, Malmgren.

Loimia savignyi, n. sp. (Pl. XXVIIA. fig. 23; Pl. XXXVIIA. fig. 7).

Habitat.—Dredged in July 1873, off St. Vincent, Cape Verde Islands.

The representatives consist of two fragments of the posterior end, each of a separate example, and apparently male and female. The segments are two-ringed.

The hooks (Pl. XXVIIA. fig. 23) differ from those of *Loimia medusæ*, Savigny, as shown in the English examples, and also from Grube's Philippine specimen.

The body-wall of this form (Pl. XXXVIIA. fig. 7) deviates notably from the usual type of the Terebellidæ in the position of the nerve-cords, which are situated a short distance within the circular coat, and between the longitudinal ventral muscles. The nerve-area, moreover, is rounded, and is invested by a firm fibrous coat. Externally the cuticle is hardly distinguishable in the preparations, but the hypoderm is of considerable thickness. The circular muscular coat is powerful. The longitudinal dorsal muscles extend over the whole upper arch and down to the processes for the hooks, thus occupying three fourths of the circumference. The most bulky region is inferior; and in the dorsal median line is a hiatus. The longitudinal ventral are sausage-shaped in section, and only very slightly diminished on each side of the nerve-area, which is thus guarded laterally. The oblique muscles are not visible in the preparations, but a pair of strong muscular bands pass from the alimentary canal to the circular coat external to the nerve-area. In the space below the intestine is the ventral blood-vessel. The alimentary canal is suspended by a strong band from the median dorsal line, and is further kept in position by the two inferior bands. It presents the usual glandular folds, one over the median ventral region surpassing the others in size. A series of branched tubular glandular organs occur in the perivisceral chamber, and are probably associated with the numerous ova in their neighbourhood.

The structure of the region between the great fang and the anterior inferior margin seems to be of considerable comparative value in hooks taken from the same somite.

In the intestine of one example was a quantity of whitish sand containing many Foraminifera, sponge-spicules, minute bivalve Mollusks, Ostracoda, fragments of Algæ, hydroid zoophytes, and minute ova.

Schmardanella,[1] n. gen.

Schmardanella pterochæta, (Schmarda) (Pl. LIII. fig. 1; Pl. XXVIIA. figs. 24-26).

Terebella pterochæta, Schmarda, Neue wirbell. Thiere, I. ii. p. 43.

Habitat.—Procured between tide-marks at Sea Point, Cape Town.

[1] Named after Prof. L. Schmarda, the author of the well-known work on the Annelida so often quoted.

The examples collected by the naturalists of the Challenger appear to be smaller than those found by Schmarda, who gives the length at 150 mm. It is probable, however, that this author refers to the condition in the living animal.

The general aspect of the Annelid somewhat resembles the common *Nicolea* from the Channel Islands, the dorsum being minutely corrugated all over by longitudinal folds. The latter condition is most distinct anteriorly, but is also quite visible toward the anus.

The somewhat slender cephalic tentacles are in immense profusion. No ocular specks are present, the species agreeing in this respect with its ally from the Channel Islands; and the same may be said of the buccal region. The branchiæ are stated by Schmarda to be three, but there is probably a mistake in regard to number, as the structure of the bristles and hooks would lead us to expect only two. The first arises on each side from the second segment as a dense bush supported on a stout though short pillar terminating in many branches. The ultimate divisions are short, and give a curled aspect to the surface of the bush. The second branchia is attached to the third segment, and is considerably smaller. This species has much shorter terminal divisions than that from the Channel Islands. It agrees with *Nicolea* in having two branchiæ, but differs in other respects.

Instead of having fifteen pairs of bristle-bundles as in *Nicolea*, there are thirty-three, the first springing from the fourth segment; while the shape of the process on which they are borne, and the structure of the bristles themselves, are quite different from those in the form alluded to. The bristles spring from elevated vertical ridges, those at the dorsal edge (Pl. XXVIIA. figs. 24, 25) consisting of elongated winged forms, somewhat after the usual type, but their slender tips are pectinated in every instance, though it is not always visible in the preparations. Schmarda, indeed, mentions that the dorsal forms are simply winged, but he has probably overlooked the delicate pectinations. The tips diminish in length as we proceed downward, and the wings become broader, the pectinated region at the tip being longer and more evident. All follow the same type, the intermediate bristles having narrower wings and very distinctly pectinated tips, the appearances shown by Schmarda being due to imperfect examination. The pectinations are quite visible in the interior of the setigerous lobe, before the extremities of the winged bristles have been extruded.

The hooks (Pl. XXVIIA. fig. 26) are peculiar, presenting superiorly in profile three or four small teeth above the great fang, while the posterior margin forms an almost continuous and uniform curve with the ventral or basal margin, a small mucro only indicating the separation. The ventral border is evenly convex, from its commencement posteriorly forward to the anterior angle. Very little change occurs in the posterior hooks. These organs resemble the uncini of *Terebella meckelii*, Delle Chiaje,[1] a form, however,

[1] Claparède, Annél. Chétop., p. 391, pl. xxviii. fig. 3.

which has three pairs of branchiæ. Schmarda's fig. *d* (*loc. cit.*, p. 43) is a somewhat inaccurate but recognisable representation of the hook, but his fig. *d'* probably refers to another species, it may be that with the three branchiæ.

The coarse sand in the intestine shows fragments of the spines of Echinoderms, minute Crustacea, sponge-spicules in great variety, and a few Foraminifera and Diatoms.

Grube[1] mentions that the *Terebella* (*Phyzelia*) *atricapilla*, Ehrenberg, from the Red Sea, has from eighteen to twenty-two bristle-bundles and two pairs of branchiæ, but this form diverges in other respects.

The genus *Scionopsis* of Verrill[2] is either allied to this form or to *Pista*, but the absence of the minute characters renders its position at present doubtful.

Pista, Malmgren.

Pista sombreriana, n. sp. (Pl. XXVIIA. fig. 27).

Habitat.—Dredged in 470 and 390 fathoms, off Sombrero and St. Thomas, West Indies.

A fragment of the anterior region of a small *Pista*, having a diameter of about 2 mm. The tentacles and branchiæ are absent. There are seventeen pairs of bristle-bundles of the ordinary structure, only the winged tips are proportionally longer than in *Pista cristata*. In the imperfect condition of the specimen the uncini alone can be relied on as distinctive. Each (Pl. XXVIIA. fig. 27) has a crown of three or four hooks above the great fang, the space beneath the latter differing decidedly from the same part in *Pista cristata* in its proportionally smaller size. The curves both above and below the anterior inferior projection are also characteristic. The entire outline, indeed, differs in minute detail, and the straight process is much larger than in the common form.

The whitish sand in the alimentary canal contains the small circular spicular bodies formerly alluded to in other forms from the same site, sponge-spicules, and small Foraminifera. The most characteristic feature is the first mentioned.

The great size of the oblique muscles and their contraction in the preparations cause the body-wall in section to assume the shape of a trefoil, the long dorsal arch exceeding the two lateral in size. The circular muscular coat is largely developed, and the dorsal longitudinal are also conspicuous by their massive proportions. The hiatus between the ventral longitudinal muscles is little more than the diameter of the large nerve-cords.

[1] Grube (Anneliden des rothen Meeres), *Monatsber. d. k. preuss. Akad. d. Wiss. Berlin*, 1869, sep. Abd., p. 32.
[2] Report of the U.S. Commissioner of Fish, &c., 1874, p. 614.

Pista fasciata, (Grube?) (Pl. XLIX. fig. 5; Pl. XXVIIA. fig. 28; Pl. XXXVIIIA. fig. 3).

Terebella (*Phyzelia*) *fasciata*, Grube, Monatsber. d. k. preuss. Akad. d. Wiss. Berlin, Jahrg. 1869, p. 513.

Habitat.—Dredged off Kobé, Japan, in 8 to 50 fathoms.

The specimen is incomplete, but it is of considerable size, measuring 35 mm. in length, and having a diameter anteriorly of 3·5 mm.

In the general form of the body it agrees, even in minute detail, with *Pista cristata*. The bristles, however, are much more tapered at the tip, and the wings are narrower, the whole organ being less robust.

The hooks (Pl. XXVIIA. fig. 28) have the same relative proportions of the crown and the great fang as in *Pista cristata*, but the space beneath the latter is much less. There are also other differences in regard to the curve above the anterior inferior projection, the structure of the spinous process above the latter, and the outline of the basal region. These minor distinctions, though noteworthy, cannot be said to be great.

The branchiæ appear to have finer branches than any European example of *Pista cristata*. There are two pairs, but each organ differs in size, the right posterior being the largest.

The greyish mud in the intestine is rich in Diatoms, with here and there a sponge-spicule.

The chief feature in transverse sections of the anterior third of the body is the enormous size of the oblique muscles (Pl. XXXVIIIA. fig. 3), which pass from the supero-lateral region on each side to the ventral border, leaving between them a very wide hiatus. The cuticle and hypoderm are fairly developed, the latter having its maximum depth in the median ventral area. In this species the splitting of the strong circular coat at the nerve-area apparently in the interganglionic region is well seen. Moreover, the outer band of fibres receives considerable accessions from the oblique muscles, the fibres passing right through the inner fibres of the circular coat. The latter shows a raphe at the four points of connection with the oblique muscles. The arrangement of the oblique bands causes the longitudinal ventral muscles to be almost lateral in position. They are much more massive than the extended dorsal longitudinal muscles. A thin layer of longitudinal fibres is situated as usual inside the circular coat above the nerve-area. Large glandular organs occur in the perivisceral chamber, above the foregoing area, and in the spaces outside the oblique muscles. The œsophageal region of the alimentary canal has a thick circular coat below the outer (longitudinal), and the glandular lining is closely frilled.

This species has been referred with some doubt to Grube's form as interpreted by Marenzeller, but the anterior inferior border of the hook differs: for the latter in

Pista fasciata, according to Marenzeller,[1] shows a smoothly rounded margin, whereas the example procured by the Challenger has a process similar to that shown in the hook of the same author's *Pista maculata*. Unfortunately, Grube in many cases did not figure the hooks of his species, and even when they were represented the artist failed to appreciate their exact characters.

Pista abyssicola, n. sp. (Pl. XXVIIA. fig. 33; Pl. XXXVIIIA. fig. 1).

Habitat.—Trawled at Station 157 (midway between the Antarctic region and Australia), March 3, 1874; lat. 53° 55′ S., long. 108° 31′ E.; depth, 1950 fathoms; bottom temperature 32°·1, surface temperature 37°·2; sea-bottom, Diatom ooze.

An injured fragment of the anterior region of a somewhat large species, measuring 48 mm. in length, and having a diameter of 4 mm. at its widest part in front.

So far as can be noticed from the example, the general structure of the exterior of the body agrees with that in *Pista cristata*. Only a single branchial process is attached, and this presents a longer, but also transversely barred pedicle, and a more elongated and more lax series of whorls than in the form just mentioned. Comparatively little reliance can, however, be placed on the appearances of these variable parts.

A comparison of the bristles with those of *Pista cristata* from Shetland shows that though the species procured by the Challenger is considerably larger, the bristles are more slender and their tips more tapered, while the winged region at the extremity of each is somewhat longer. It is a feature of interest in these tufts that the developing bristles, the tips of which just project beyond the setigerous region, show the distinctive characters in a marked manner. The extremities of the bristles of this form are not so attenuate as in *Eupista darwini*.

In comparing the hooks (Pl. XXVIIA. fig. 33) with those of *Pista cristata* it is found that both are boldly striated from the crown above the great fang downward, the striæ, perhaps, being most pronounced in the abyssal form. In the latter the posterior (dorsal) line, further, presents a much bolder projection inferiorly, a feature very evident on contrasting the anterior and posterior outlines in each case. The gulf beneath the great fang in the new form is smaller than in *Pista cristata*, and the distance from the inner end to the mucro or intermediate spine is much shorter. The lower part of the uncinus, again, is more massive. It is not always easy to make out the precise outline of the hook inferiorly, since the thinner layer to which the long posterior process is attached seems to alter under pressure, and therefore is variable in its relation in regard to the harder base of the hook, which is indicated by the inner line in the figure.

The intestine contains a somewhat firm whitish mass, consisting of numerous Diatoms,

[1] Südjapan. Annel., *op. cit.*, p. 202, Tab. i. fig. 4.

slender spicules of various kinds, large reticulated as well as more exquisite minute Radiolarians, but with hardly a trace of a sponge-spicule.

The specimen is accompanied by a light greyish and somewhat friable tube composed of a hyaline, brittle chitinous basis coated with debris of Diatoms, Radiolarians, and other constituents of the ooze. The most striking difference between the tube and the foregoing food is the presence of larger and more complete Radiolarians, and fragments of minute masonry apparently pertaining to arenaceous Foraminifera.

Externally the body-wall has a somewhat thin coating of hypoderm under the cuticle, the only region in which the thickness is marked being the ventral median line. This increase in the depth of the hypoderm extends across the gap between the longitudinal muscles, and indeed over the inner angle of each of the latter. The circular muscular coat is well developed, and forms as a rule a firm belt inside the nerve-area, but at intervals (Pl. XXXVIIIA. fig. 1) the area is bounded externally by the main bulk of the fibres of this coat, while laterally an accession of fibres from the oblique partly encloses it. This change in the relations of the cords to the circular coat is noteworthy. The longitudinal ventral muscles are pointed internally, and show a short inner and a long outer division.

Pista mirabilis, n. sp. (Pl. LI. figs. 1, 2; Pl. XXVIIA. fig. 34; Pl. XXXVIIIA. fig. 2).

Habitat.—Procured at Station 320 (off the mouth of the Rio de la Plata), February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom temperature 37°·2, surface temperature 67°·5; sea-bottom, green sand.

A species inhabiting remarkable leathery tubes. Its length is about 58 mm., and its diameter anteriorly is rather more than 2 mm.

On removal from the tube the body presents a dull flesh colour or pale madder-brown hue, and the greatly developed cephalic tentacles are of the same tint. On comparing the anterior region with that in *Pista cristata* certain differences are apparent; thus the foliaceous lamella of the third segment, instead of forming an elongated process stretching from the base of the second branchia nearly to the ventral scute, and regularly diminishing from above downward as in *Pista cristata*, forms a prominent tongue-shaped process behind the single branchial column, and directed forward. Moreover, this process runs into the fold immediately in front of the first hook-row, a narrow ridge devoid of the lamella, observed in *Pista cristata*, intervening between it and the great suboral plait. The single pair of branchiæ, which are inserted in front of the tongue-shaped lamella, would appear to correspond with the first pair in the British form, and therefore belong to the second segment. The pedicle of the branchia is long, stout, and transversely corrugated, and the terminal tuft of branches is comparatively small. No tendency to a

whorled arrangement exists in the tuft, but the main trunk divides into three, and then each division splits into various processes. The ultimate twigs, which are thicker than those of *Pista cristata*, are dichotomously divided. The whole somewhat resembles the branchia of a *Terebella*, being sparsely branched, and situated at the summit of a long pedicle.

The bristles are much longer and more tapered than those of *Eupista darwini* or other allied form, a considerable portion beyond the slightly developed lateral wings being extremely attenuated. A greater amount of the whitish glandular tissue surrounds the first four hook-rows than in *Pista cristata*. The dorsal processes that occur behind the third, fourth, and fifth, however, are less developed than in the latter form.

The hook-pads (uncinigerous eminences) are much shorter than in *Pista cristata*. The hooks (Pl. XXVIIa. fig. 34) differ from all the previous types in the comparative flatness of the crown, which in profile shows about three teeth, in the proportionally small space below the great fang, and in the boldly convex nature of the anterior inferior prominence, which is so developed as to give great massiveness to the base of the hook. The posterior or dorsal outline, moreover, is characteristic, being only slightly indented about the middle, and devoid of the usual projection at the base of the long process. The latter is comparatively slender, and issues only from the posterior angle, instead of having the usual wide connection with the adjoining base. The latter presents a firmer condition than is common, and is marked by minute crenations. The characters of the entire organ are constant and easily defined.

The intestine contains a little sand, in which are a few Diatoms and fragments of sponge-spicules. The Gregarinæ in the canal are well formed, the larger presenting distinct longitudinal bands, apparently of a contractile nature.

The dark greyish or somewhat olive tubes (Pl. LI. fig. 2) are tolerably firm, rounded, chitinous structures, tapering from the anterior to the posterior extremity, and armed all over with long spinous processes. The majority of the tubes seem to have been free, but others have been immersed in sponges, a position which has favoured the preservation of the long external spines. In intimate structure the wall of the tube is marked by close wrinkles, which are so fine as almost to be linear, a feature partly due to its composition, for it consists of a vast number of needle-like glassy spicules of sponges, held together by secretion and mud. This composition gives a gritty feeling on touching the tube, while it more readily enables it to retain its circular form. Arranged somewhat alternately all over the tube, though more sparsely at the wide or anterior end, and gradually disappearing at the narrow one, are a series of spinous processes, which give the tube a characteristic appearance. They project outward in some instances a considerable length, equalling indeed several times the diameter of the tube. These appendages are lighter in colour than the latter, but are composed of similar materials, viz., sponge-spicules, secretion, and sand-grains, the latter occurring in greater quantity than in the tube proper. The proportionate diminution of the mud probably renders the

spinous processes pale. The most perfect spines occur amongst the masses of sponge encrusting certain tubes, and are fully 16 mm. in length, of a pale straw colour, and almost entirely composed of secretion and sponge-spicules. It is interesting to notice how neatly the sponge-spicules are ranged longitudinally in these processes, a considerable amount of design being apparent in every instance. From the great number as well as the length of the spines amongst the encrusting sponge, it would appear that a special advantage had been gained, other than is observable in the protective function of the sponge, or that special efforts had been made under the circumstances. The spines have a broad base of attachment, and then are slightly tapered upward to the point, the spicules at the tip being drawn together to form a termination. Besides the spicules, numerous twigs of Polyzoa are attached to the tubes.

The tubes are all simple, the only apparent branching being due to the attachment of a tube belonging to another species, or a smaller one of the same form. The length varies, the longer examples reaching 150 to 160 mm., with a diameter of about 4 mm. Some present a soft flexible prolongation at the posterior extremity.

Microscopically the wall of the tube shows a vast series of sponge-spicules, often laid in close parallel rows, numerous sand-grains, and fine particles of mud. A few Diatoms, bristles of Annelids, and small Foraminifera also are present.

In the interior of one of the tubes are many ova, arranged in a somewhat linear manner, but such may have been due to rupture of the body of the parent and not to any special nidamental disposition. The Annelid was distended with ova in various stages of development.

The sections of the anterior third of the body-wall of this species present a characteristic appearance, since they are more definite and firm than usual in the group (Pl. XXXVIIa. fig. 2). The hypoderm forms a thin coat dorsally, but assumes greater bulk toward the infero-lateral regions. In the ventral median line it constitutes a thick external envelope to the nerve-area. Moreover, in the preparations it seems to have an intimate relation to a large mass of similar structure and of a somewhat foliate aspect, extending between the oblique and ventral muscles, and superiorly almost touching the alimentary canal. This constitutes a great glandular mass, with whitish opaque regions here and there, which must have a special function, probably of secretion. The large and rounded nerve-cords are situated in the outer portion of the median hypoderm, their inner (upper) boundary being the circular muscular coat, while a belt of hypodermic fibres is placed externally. A small neural canal lies between them. The circular muscular coat is of more than average strength. A thin band of longitudinal fibres lies on the inner surface of the latter coat over the nerve-area. Moreover, in what appear to be the interganglionic regions, the same changes in the relationship of the nerve-cords to the circular coat occur as in *Pista abyssicola*. The hiatus between the ventral longitudinal muscles is lessened, the cords

pass to the inner surface of the circular coat, having internally (superiorly) only a basement-band, the thin stratum of longitudinal fibres, and the foliate glandular masses. The hypoderm outside the circular coat, again, is at once firmer and narrower. The oblique muscles are well formed and powerful, and are inserted at the outer borders of the wide median hiatus, which is about thrice the transverse diameter of the nerve-area. The longitudinal ventral muscles are firm, wedge-shaped masses bounded internally by the oblique, and externally by the circular muscular coat. The longitudinal dorsal form extended plates of nearly uniform diameter, and separated superiorly by a rather wide hiatus. From the latter issues the broad suspensorial band of the alimentary canal. The latter is firm and finely striated from the closely arranged glands. The œsophageal region has an external investment, showing many longitudinal fibres, a thick circular muscular layer, and a symmetrically folded glandular lining. The glands on the edges of the opposing folds have such a disposition that they resemble ears of wheat. The perivisceral chamber also contains the ovaries with ova at various stages.

Pista corrientis, n. sp. (Pl. XLVIII. fig. 11; Pl. XXVIIA. fig. 35).

Habitat.—Amongst the tubes of *Pista mirabilis* was a fragment of a sandy tube, strengthened by Foraminifera, greenish translucent grains of chlorite, and other debris, containing the species above mentioned. It also, therefore, belongs to Station 320 (off the mouth of the Rio de la Plata), February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom temperature 37°·2, surface temperature 67°·5; sea-bottom, green sand.

The form is comparatively small, measuring about 28 mm. in length, and having a diameter anteriorly of a little more than 1 mm.

In comparing the anterior region with that of *Pista cristata*, the great development of the lateral lamellæ of the second segment is conspicuous. These form large lobes on each side, projecting as far forward as the most anterior cephalic flap. The tentacles being absent, the head-lobe appears to be sheathed in them, when viewed from the ventral surface. A wide gap exists between their dorsal edges, and a smaller between their ventral, the lamellæ arising more abruptly at the former than the latter. The lamellæ of the third segment are, perhaps, somewhat larger and thinner than those of *Pista cristata*, but instead of being borne erect or carried forward, each is reflected backward, so as to cover a series of ocular specks, ranged in a dense row posteriorly at their base. The dorsal surfaces of this and the foregoing segments are large, and bear traces of the pedicles of four branchiæ, but nothing further can be said of the latter.

The bristles possess comparatively short tips, with well-marked wings. They are proportionally shorter than in *Pista cristata*, while the winged region is longer and better developed.

The anterior uncinigerous processes are somewhat shorter than in *Pista cristata*. The hooks (Pl. XXVIIa. fig. 35) present a small projection above the long posterior process, and the anterior angle is much more produced than in *Pista mirabilis* or *Pista cristata*. The posterior long process is proportionally larger than in *Pista mirabilis*. The posterior projection in these hooks seems to be the heel, the hollow beneath being due to the mode of attachment of the base of the long process. The ventral edge or base of the hook is slightly roughened.

The somewhat coarse sand in the intestine presented a few Diatoms and sponge-spicules.

The *Pista intermedia* of Webster and Benedict[1] is a closely allied form, the hooks, indeed, presenting only slight differences.

Eupista, n. gen.

Eupista darwini, n. sp. (Pl. L. figs. 2, 3; Pl. XXVIIa. figs. 30, 31).

Habitat.—Trawled at Station 298 (off the west coast of America, south of Valparaiso), November 17, 1875; lat. 34° 7′ S., long. 73° 56′ W.; depth, 2225 fathoms; bottom-temperature 35°·6, surface temperature 59°·0; sea-bottom, blue mud.

About the average size of *Pista cristata*. Though considerable care has been exercised, the specimens are somewhat softened, the dense tubes of mud plugged by the animals being unfavourable for the percolation of the spirit.

In the general form of the body this species agrees with *Pista*. The cephalic lobe is furnished anteriorly with numerous sulcate tentacles. No ocular specks are present. The branchiæ, again, wholly differ in structure, while corresponding in number and position with the foregoing genus. They are simple processes similar to those in the Ampharetidæ, tapering from base to apex, the anterior pair being the larger; moreover, all are barred transversely, a feature which distinguishes them from the family just mentioned, while they resemble the stems of the branchiæ in the ordinary form. In one instance an anterior branchia is evidently in process of reparation, as the base is thick, and the tip abruptly filiform. The posterior pair are furnished with a short filiform tip. The blood of this species is thus satisfactorily aerated at the great depth of 2225 fathoms, without the aid of the minute appendages generally present in the branchiæ. Dorsally no elevated process is found on the third segment at the base of the posterior branchiæ as in *Pista cristata;* and the anterior border of the fourth segment forms a transverse ridge behind them.

The bristles agree in number with those in *Pista*, being seventeen pairs, the first occurring on the fourth segment. They differ from those of *Pista* in the great length

[1] Report U.S. Commissioner of Fish and Fisheries (1881), 1884, p. 733, pl. vi. figs. 75–78.

of the winged region, and the more attenuate condition of the bristle, the comparative differences being represented in Pl. XXVIIa. figs. 29 and 30, the former being a bristle from *Pista cristata*, the latter from the present species.

The shape of the hooks (Pl. XXVIIa. fig. 31) diverges from that in *Pista cristata* in the dorsal and posterior curves, in the smaller space beneath the great fang, and in the attachment of the arm. The latter seems to have a thinner expanded base, by which it becomes continuous with the base of the hook. There are three distinct teeth in profile above the great fang, and a trace of a fourth.

In the greyish mud of the alimentary canal are Diatoms, small *Globigerinæ* and other Foraminifera, Radiolaria, and an occasional fragment of a sponge-spicule. Numerous bodies like Coccoliths are also present.

The tube consisted of a tough lining coated externally with fine brownish-grey mud. Comparatively few Diatoms and sponge-spicules occurred amongst the latter, the chief organic structures being the tests of arenaceous Foraminifera.

Eupista darwini, n. sp. var. (Pl. XXVIIa. fig. 32).

Habitat.—A softened fragment closely approaching the foregoing was trawled at Station 63 (Mid Atlantic, between the Azores and Bermuda), June 19, 1873; lat. 35° 29′ N., long. 50° 53′ W.; depth, 2750 fathoms; surface temperature, 71°·0; sea-bottom, red clay.

The characters of the cephalic region of the fragment are indistinguishable, and the branchiæ are absent. The bristles agree with those of *Eupista darwini* in being longer and more slender than those of *Pista cristata*. The hooks (Pl. XXVIIa. fig. 32) exhibit a slight modification in the straightness of the dorsal line, and in the greater elevation of the crown when contrasted with those of *Eupista darwini*. The space below the great fang is also somewhat smaller.

Sufficient materials, however, are not at hand to establish a reliable distinction, if such exist.

Attached to the posterior region was the small rounded body of a Crustacean parasite with an ovoid mass of eggs in a hyaline sheath. Beyond the presence of a chitinous investment, and traces of segmentation, little could be made out in the injured example. In simplicity of structure it resembled the *Trophoniphila* parasitic on *Trophonia argillei*.[1]

Eupista grubei, n. sp. (Pl. XLIX. figs. 6, 7; XXVIIIa. fig. 1).

Habitat.—Trawled at Station 325 (in the Atlantic, in a line off the Rio de la Plata). March 2, 1876; lat. 36° 44′ N., long. 46° 16′ W.; depth, 2650 fathoms; bottom temperature 32°·7, surface temperature 70°·8; sea-bottom, blue mud.

[1] *Vide*, p. 368.

Only fragments of this form are attainable, as they had been imperfectly preserved in their tubes of fine mud with the impermeable chitinous lining. Sufficient of the anterior region remains, however, to show that in general characters the animal agrees with the preceding. The branchiæ, however, are much smaller; moreover, the proportions which the pairs have to each other would seem to point to such as the normal condition. The anterior pair are subulate, and attached on each side of the middle line. Their length is about a third the diameter of the body. The posterior pair occur immediately behind on the third segment, and consist of shorter and stouter processes than the first pair, with filiform tips. The bristles are shorter and somewhat more robust than in *Eupista darwini*, and their extremities are less attenuate. The hooks, again (Pl. XXVIIIA. fig. 1), very closely resemble those of *Eupista darwini*, from Station 63. Indeed, all the three so nearly approach each other in the structure of the hooks that it is difficult to detect the differences.

Posteriorly the anus has a fringe of sixteen conical papillæ (Pl. XLIX. fig. 6).

The dark greyish mud in the intestine contains Diatoms, fragments of sponge-spicules, some spinose, a few minute Foraminifera, and rather coarse sand-grains.

The tubes are formed of dark greyish sandy mud, enlivened here and there with the large ochreous arenaceous Foraminifera formerly mentioned, and the globular wall of which is composed of minute sand-grains, with or without the addition of sponge-spicules. The muddy part of the tube shows traces of a few Diatoms, fragments of sponge-spicules, and Foraminifera. The internal lining is tenacious.

Leæna, Malmgren.

Leæna neo-zealaniæ, n. sp. (Pl. LI. fig. 3; Pl. XXVIIIA. figs. 2, 3).

Habitat.—Dredged at Station 168 (off the east coast of the North Island, New Zealand). July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature 37°·2, surface temperature 57°·2; sea-bottom, blue mud.

An imperfect example of a comparatively small species inhabiting a tube composed of soft greyish mud externally, and internally of a tough hyaline membrane. The length seems to be about 23 mm., and the diameter at the thickest part anteriorly is somewhat more than 1 mm.

The specimen is softened and injured, but it appears to have a truncated snout, with a projecting collar at the margin. Dorsally in a space behind the collar four transverse rings are visible, the sides of this area being overhung by two lateral lamellæ, and the posterior boundary completed by another smaller pair.

The state of the specimen forbids a calculation of the bristle-bundles. Each of the longer bristles (Pl. XXVIIIA. fig. 2) has a finely tapered, though short, tip, with a some-

what broad wing beneath. The shorter series show a proportionally broader and shorter, but finely tapered extremity. They resemble on the whole those of *Leæna*, the tips, however, being longer, and the wings as well developed as in *Laphania*, though they do not agree with Malmgren's figure of the shorter series in *Laphania boecki*. They also differ considerably from the terminal serrated sabre of *Lanassa*. The bristles throughout are rather translucent.

The very minute hooks (Pl. XXVIIIA. fig. 3) correspond in general outline with those in *Lanassa*, but the crown, instead of having four or five teeth, has eight or nine, so that it is greatly elongated, the entire upper region, indeed, being disproportionately large, a feature which becomes very conspicuous when the organ is contrasted with the hook of *Lanassa nordenskiöldi*. The curves below the great fang also diverge, and the anterior inferior projection is bent upward.

The minute portion of sandy mud in the alimentary canal shows only a few Diatoms and Coccoliths.

The greyish mud so loosely attached to the hyaline lining of the tube is only slightly calcareous, the greater part remaining unaffected by acid. It is chiefly composed of minute sand-particles, muddy granules, with a considerable number of small arenaceous Foraminifera, but only a very few Diatoms and sponge-spicules.

The hooks somewhat approach those of the *Leæna graffii* of Langerhans[1] from Madeira, but differ in the presence of a secondary process between the great fang and the anterior inferior margin.

Leæna abyssorum, n. sp. (Pl. XXVIIIA. figs. 8, 9).

Habitat.—Dredged at Station 253 (in the middle of the Pacific, 1000 miles north of the Sandwich Islands), July 14, 1875; lat. 38° 9′ N., long. 156° 25′ W.; depth, 3125 fathoms; bottom temperature 35°·1, surface temperature 67°·7; sea-bottom, red clay.

The specimen was attached to a nodule described by Mr. Murray.[2]

The fragments of the example, when placed in a line, measure about 26 mm., with a diameter of 2 mm.

The condition of the specimen prevents more than a reference to the structure of the bristles and hooks. The great depth from which it was dredged is probably connected with its injured state. The anterior dorsal (nuchal) ridge is much more bevelled from behind forward than in *Lanassa*.

The bristles (Pl. XXVIIIA. fig. 8) have rather long straight shafts with short tips, which taper to a fine point. The wings are well developed, and extend almost to the extremity. The structure thus differs from *Lanassa* and approaches *Leæna*, being a

[1] *Zeitschr. f. wiss. Zool.*, Bd. xl. p. 262, Taf. xv. fig. 21*d*.

[2] See Narr. Chall. Exp., vol. i. p. 758, 1885; and Report on Deep-Sea Deposits, pl. ix. fig. 1.

further stage of the type seen in *Leæna neo-zealaniæ*. The shorter bristles as usual have broader and shorter wings, and somewhat longer tips.

The hooks (Pl. XXVIIIA. fig. 9) are characteristic, presenting in profile six or seven visible teeth above the great fang. The mucro beneath the latter is in close proximity, an unusual condition in the series. The outline of the basal region differs from that of any known form, and the area of this part is comparatively large. A few faint transverse lines occur above the ventral margin.

The mud in the intestine contains a few Diatoms, fragments of Radiolarians. Both are, however, rare amongst the fine muddy debris.

The muddy wall of the tube, again, presents larger and more perfect Radiolarians of the trilobate kind formerly observed, arenaceous Foraminifera, fragments of sponge-spicules, and a few Diatoms.

Leæna antarctica, n. sp. (Pl. XLVIII. figs. 9, 10; Pl. XXVIIIA. figs. 10, 11).

Habitat.—Dredged at Station 156 (a little north of the Antarctic Sea), February 26, 1874; lat. 62° 26′ S., long. 95° 44′ E.; depth, 1975 fathoms; surface temperature, 33°·0; sea-bottom, Diatom ooze.

One or two fragments of a small form, the longest measuring 16 mm., and being rather more than 1 mm. in diameter at its widest part anteriorly.

The body presents the usual appearance, with a horse-shoe shaped process, from which the tentacles proceed, above the mouth. It is difficult to estimate accurately the number of bristle-bundles, but they seem to correspond with the typical number, viz., ten. The longer forms (Pl. XXVIIIA. fig. 10) have straight shafts and finely tapered tips, and the wings are well developed. The shorter bristles, one of which is represented at the lower part of the same figure, have broader wings and more attenuate tips. Four or five of each kind occur in a tuft.

The hooks (Pl. XXVIIIA. fig. 11) are comparatively small, four teeth, however, in favourable views being visible above the great fang. The exact nature of the outline beneath the latter is somewhat indefinite, but a slight projection (mucro) occurs a short distance below the base of the fang, and then a shallow excavation. The ventral margin is evenly convex. The hooks form a double row in front as in *Leæna*.

The tip of the tail terminates in an expanded cup or funnel (Pl. XLVIII. fig. 10), the anus being situated at the upper part of the latter, which in regard to the axis of the body is directed upward and forward. Thus the lower rim proceeds further backward than the anterior.

Diatoms appear in the mud in the intestine, but only a small quantity could be examined.

The tube is composed of a thin, translucent, chitinous lining coated with a friable

layer of soft greyish mud. The latter shows swarms of Diatoms, a few Radiolarians, and somewhat coarser sand-particles than occur in the alimentary canal.

In this genus the nerve-cords seem to follow a similar arrangement to those in *Pista*. In the present species the body-wall has powerful oblique muscles, which are inserted outside the nerve-area. The perivisceral chamber contains many ova.

Leæna langerhansi,[1] n. sp. (Pl. XXVIIIA. fig. 12).

Habitat.—Trawled at Station 168 (off the east coast of the North Island, New Zealand), July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; depth, 1100 fathoms; bottom temperature 37°·2, surface temperature 57°·2; sea-bottom, blue mud.

The fragmentary example measures about 9 mm. in length and barely 1 mm. in diameter.

In the general form of the body it agrees with *Leæna neo-zealaniæ* from the same site, and it seems to have similar tongue-shaped processes on the post-cephalic region of the dorsum; but as rupture with softening had occurred in the specimen, it would be unsafe to define minutely.

So far as can be ascertained, twelve pairs of bristle-bundles exist. The extremities of these closely resemble those of the other species, *e.g.*, *Leæna antarctica*, the shorter series, perhaps, having less expanded wings.

The hooks (Pl. XXVIIIA. fig. 12) are small, and diverge from any of the preceding. The crown is of moderate height, with five teeth above the great fang. The curves on each side of the mucro below the latter are pronounced, and the ventral line is convex. The dorsal (or posterior) outline is tolerably straight above the heel. With the exception of the difference in the length of the crown the structure of the hook most nearly approaches that of *Leæna neo-zealaniæ*. It is not yet known how far sexual distinctions affect the hooks, so that the position of this form is uncertain.

In transverse section the hypoderm presents a thick layer ventrally. The circular muscular coat is of great strength. The longitudinal muscles, both dorsal and ventral, are compact and massive. The oblique are likewise well developed.

Lanassa, Malmgren.

Lanassa sarsi,[2] n. sp. (Pl. XXVIIIA. figs. 4, 5).

Habitat.—Dredged at Station 169 (off the north-east point of the North Island, New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; sea-bottom, blue mud.

[1] After Prof. Paul Langerhans of Freiburg, and Physician in Madeira, who has done much valuable work amongst the Annelids of Madeira.

[2] After the late Prof. M. Sars.

An injured fragment of the anterior end, consisting of the cephalic region and about a dozen bristled segments measuring 8 mm. in length, and having a breadth of 2·5 mm., or 4 mm. inclusive of the bristles.

The general form of the anterior region agrees with *Lanassa nordenskiöldi*, Malmgren, the dorsum being especially rugose and warty in the form procured by the Challenger. A prominent papilla lies in front of the base of the first setigerous process, and a diminishing series in the following seven or eight interspaces (setigerous). The bristles (Pl. XXVIIIA. fig. 4) are pale and long, even longer and more slender in proportion than in Malmgren's species. Each has a somewhat straight shaft, with very narrow wings at the upper part, this region being followed by a very long, flattened, tapering tip, delicately serrated on one edge. A comparison of the tips of the two species is diagnostic, the northern form being more distinctly widened beyond the wings, and more abruptly tapered.

The hooks (Pl. XXVIIIA. fig. 5) have even a more highly elevated crown than in *Leæna neo-zealaniæ*, and of course much more than in *Lanassa nordenskiöldi*. The crown has at least ten teeth above the great fang. The outlines of the posterior edge and heel quite differ from the first mentioned, the basal region is less convex, and the curves below the great hook have little resemblance, and cover a longer space, since the anterior inferior angle is much more produced.

The intestine contained a little greyish sandy mud in which a few Diatoms, Coccoliths, and fragmentary Radiolarians occurred.

The body-wall agrees in structure with *Pista* and the previous species, the hypoderm having a great ventral projection, and the circular muscular coat being remarkably thick. The longitudinal ventral muscles are firmly enclosed by the oblique muscles internally and the circular coat externally. The hiatus above the nerve-area has about the same transverse diameter as the latter. The longitudinal dorsal muscles are almost continuous. The ovaries and numerous ova occur in the perivisceral chamber.

Lanassa benthaliana, n. sp. (Pl. XLVIII. fig. 8; Pl. XXVIIIA. figs. 6, 7).

Habitat.—Dredged at Station 63 (Mid Atlantic, between Bermuda and the Azores), June 19, 1873; lat. 35° 29′ N., long. 50° 53′ W.; depth, 2750 fathoms; surface temperature, 71°·0; sea-bottom, red clay.

A mutilated anterior fragment, about 2 mm. in diameter and 10 mm. in length.

No tentacles are present. The dorsum shows anteriorly four boldly elevated ridges, corresponding with four segments, the three anterior (second, third, and fourth somites) having lateral lamellæ, the first or largest meeting its fellow of the opposite side ventrally, and forming a second suboral papillose ridge or

lamella. The snout presents the usual horse-shoe curve of the tentacular fold over the mouth, and beneath the latter a short crenated ridge, in front of the papillose one just mentioned. The two other lateral lamellæ converge to an elevated region which becomes continuous with a ventral ridge immediately behind the foregoing. The first bristle-papilla springs from the upper angle of the third lamella (fourth segment), and thus corresponds with the ordinary arrangement in *Lanassa*. Fifteen pairs of bristle-tufts are present in the specimen, but as it is ruptured at the fifteenth the number is uncertain. The bristles (Pl. XXVIIIA. fig. 6) agree in structure with the generic type, presenting a straight shaft, a slightly bent winged region, and a long delicately tapered point, minutely serrated on one edge. Those of the shorter series in each tuft have somewhat shorter and broader (well-developed) wings.

The hooks (Pl. XXVIIIA. fig. 7) are much larger than in the preceding forms, and while the crown shows ten or eleven teeth above the great fang, it is less obtuse than in these. A long process occurs at the posterior inferior angle after the manner of that in *Pista* and *Eupista*. The region from the base of the great fang to the anterior inferior projection is large, much larger in proportion than in the foregoing species.

In the fine mud occupying the posterior end of the fragmentary alimentary canal are many minute *Globigerinæ*, a fine *Challengeria*, minute triradiate points (minute Pteropods ?), a few Diatoms and Coccoliths.

Euthelepus, n. gen.

Euthelepus setubalensis, n. sp. (Pl. L. fig. 4 ; Pl. XXVIIIA. fig. 13).

Habitat.—Dredged at Station II. (off Setubal, Portugal), January 13, 1873 ; lat. 38° 10′ N., long. 9° 14′ W. ; depth, 470 fathoms ; surface temperature, 57°·0 ; sea-bottom, green mud.

The anterior region of a small form, measuring about 12 mm. in length, or with the tentacles and branchiæ 4 or 5 mm. more, and having a diameter of 1·8 mm.

It is easily distinguished from any of its congeners by possessing the habit of a *Thelepus*, and the branchiæ of one of the Ampharetidæ. The bristles and hooks are also characteristic.

The cephalic lobe is truncated anteriorly and furnished with a rim posteriorly as in *Thelepus*, and it gives rise to a series of tentacles which are similarly grooved and crenated, though they do not appear to attain the dimensions exhibited by the form just mentioned. No ocular specks are visible. The buccal segment presents a frilled

arch superiorly, and a median ventral plate as in *Thelepus*. It forms a well-marked ridge behind the cephalic rim dorsally, but this gradually becomes absorbed on each side into a flattened area behind the infra-oral lobe. The next three segments differ from those of *Thelepus* in presenting a process or lobe jutting forward from the anterior border on each side, and in having a long simple branchia passing in each case from the same border (anterior) a little dorsad of the lobe just mentioned. The branchiæ are proportionally large, massive, and long, quite as large as those of the Ampharetidæ. Each springs by a broad base from the extreme front of the segment to which it belongs, and tapers to a blunt point, the entire surface being crenate, and marked by a ventral line, probably from the blood-vessel. They thus differ from the frilled and deeply (dorsally) grooved tentacles. The posterior pair are nearest the middle line of the dorsum, only a brief interval separating them; the next are the first or anterior pair, which have a wider space between them; while the second pair are most external in position, the inner border of the base being quite clear of the third pair, and only slightly overlapping the outer edge of the anterior pair. This condition of the respiratory system seems to be unique in the Terebellidæ, combining, as already stated, the branchial characters common to another family, viz., the Ampharetidæ. The three segments alluded to have rudimentary bristle-tufts. Each of the next two rings bears a small bristle-bundle superiorly, then a rounded papilla, and inferiorly a short hook-row, the whole forming a lateral band. The papilla is visible in the next segment, but thereafter disappears; the ordinary condition of the foot being a setigerous process dorsally with its tuft of bristles, and then a long uncinigerous pad or ridge.

About a dozen anterior segments show ventral scutes, the glandular tissue of which is not circumscribed as in *Thelepus*, but passes upward at each side, and thus gives a character to the region.

Twenty pairs of bristles are visible behind the three branchial segments. The bristles have long straight shafts with a well-marked band a little above the commencement of the wings. The latter are fairly developed, and merge distally into the tapering tip.

The hooks (Pl. XXVIIIA. fig. 13) differ from those of *Thelepus* in having the anterior mucro dorsad of the tip (anterior inferior process). The mucro is also longer. A large and a small tooth occur above the great fang, and a series of striæ are present near the posterior angle.

The tube, in which the fragment was entirely enveloped, has an internal lining of translucent chitinous secretion invested by a remarkable *chevaux-de-frise* composed of Hexactinellid sponge-spicules, the whole forming a glassy translucent investment. It does not follow that the animal specially arranged these for defensive purposes, since they were probably the only materials at hand, a supposition the more likely as the transparent connecting medium had entangled no other organism of note. A certain

selective power, however, must have been exercised, for the alimentary canal contained greyish mud in which small *Globigerinæ* and other Foraminifera, an occasional sponge-spicule, and numerous Coccoliths were found.

The body-wall presents a largely developed hypoderm, that along the ventral arch being especially massive. The nerve-cords are comparatively large, elongated from above downward, so as to present the aspect of an olive, or together of a double cocoa-nut. They are placed outside the circular muscular coat, which is moderately developed. The longitudinal dorsal muscles are somewhat less extended than usual in the group, and are thin. The attachment of the fibres suspending the alimentary canal alone disconnect them. The longitudinal ventral, on the other hand, are proportionally extended as well as massive, and the hiatus between them is moderate. The oblique are moderately developed, and are fixed to the circular just outside the nerve-area. The anterior glands and perivisceral corpuscles occur in the body-cavity.

The type differs from any known form in regard to the structure and arrangement of the branchiæ (which appear to be diagnostic). The hooks, however, have certain relations with *Thelepus*, but differ from the known genera in the direction of the mucro. The number of the bristle-bundles is the same as in *Phenacia*, De Quatrefages, viz., twenty pairs.

Euthelepus chilensis, n. sp. (Pl. LI. figs. 4, 5; Pl. XXVIIIA. figs. 14, 15).

Habitat.—Trawled at Station 299 (off Valparaiso), December 14, 1875; lat. 33° 31′ S., long. 74° 43′ W.; depth, 2160 fathoms; bottom temperature 35°·2, surface temperature 62°·0; sea-bottom, blue mud.

The longest fragment measures about 35 mm., with a diameter anteriorly of 2·5 mm. As usual the tough lining of the tube has prevented early percolation of the spirit, so that the greater part of the animal is pulpy.

This is another example of the remarkable type observed in *Euthelepus setubalensis*, and apparently intermediate between the Ampharetidæ and the present family. Anteriorly are a number of large crenate tentacles, longest dorsally and diminishing on each side ventrally. The latter form a fan-shaped series in the preparation, probably partly due to the effect of compression (the animals having been preserved in their tubes). The dorsal tentacles are very long and thick, extending in the specimens to the seventh or eighth bristled segment. Moreover, they are not marked by grooves, though some of the short ventral forms show a basal furrow. They arise as in *Thelepus* from the truncated cephalic region, and completely occupy the lobe all round. The buccal segment bears no processes. The next segment (the first bristled) has at its anterior border a pair of long smooth subulate branchiæ, which taper

from base to apex, but are not much attenuated at the tip. A second pair, similar in all respects, occur at the anterior border of the third segment. They are thus fewer than in *Euthelepus setubalensis*, and vary in position, for the anterior pair are nearer the middle line than the posterior.

Twenty pairs of bristle-tufts apparently are present, but as the specimens are much softened and ruptured this determination is questionable. The bristles (Pl. XXVIIIA. fig. 14) have a pale golden lustre, and, though some are shorter than others, do not show the marked division into groups so characteristic of *Thelepus* and the Terebellidæ. They taper from a short distance above the base to the tip, which has narrow wings, the extremity in many showing a slight enlargement at the termination of the wings. The bristles are thus somewhat intermediate in structure between the two families above mentioned.

The hooks (Pl. XXVIIIA. fig. 15) approach those of the previous species, having one evident tooth above the great fang, and a smaller and less distinct one superiorly. The space below the fang is much larger than in *Euthelepus setubalensis*, and the tip of the mucro is more globular. The anterior inferior angle is smoothly rounded so that the aspect of this region differs notably from that of the former species. The dorsal outline is similar, but the ventral is less convex than in *Euthelepus setubalensis*. The posterior hooks have the anterior inferior angle less rounded, and occasionally more than two teeth occur above the great fang.

The brownish mud in the alimentary canal presented a few Diatoms and fragments of sponge-spicules, a few small *Globigerinæ* and arenaceous Foraminifera (apparently with muddy tests), peculiar conical Radiolarians with an acutely pointed apex, and other forms.

The animal forms a massive tube composed of dark brownish mud surrounding the usual chitinous lining. Scattered here and there amongst the mud are globular arenaceous Foraminifera of a somewhat ochreous tinge and about the size of No. 12 shot, and occasionally a cylindrical tubular form of the same kind. In minute characters the mud of the tube corresponds with that in the alimentary canal, only Diatoms and Radiolarians are rare, and small arenaceous Foraminifera and rough sand-grains more abundant.

The hypodermic layer is also much developed ventrally in this species, especially towards the median line, over the nerve-area. By the bending inward of the circular coat in the latter region the longitudinal ventral muscles almost form a semicircle and are less massive than in *Euthelepus setubalensis*. The oblique muscles are of considerable strength. The nerve-cords are similar in shape to those of the former species, but are proportionally less.

Thelepus, Leuckart.

Thelepus sp. (Pl. XXVIIIA. fig. 16).

Habitat.—Dredged at Station 186 (in Torres Strait, between Australia and New Guinea), September 8, 1874; lat. 10° 30′ S., long. 142° 18′ E.; depth, 8 fathoms; surface temperature, 77°·2; sea-bottom, coral mud.

A fragment of the posterior end with the anus, measuring 30 mm. in length, and having a diameter of about 4·5 mm.

In general appearance this specimen agrees with the corresponding region in *Thelepus cincinnatus*, though the bristle-papillæ and the uncinigerous processes are less prominent. The form of the bristles resembles those of the typical species, but the tip beyond the termination of the wings is much more filiform and elongate.

The hooks (Pl. XXVIIIA. fig. 16) show only a single tooth above the great fang, and are remarkable for the great production of the anterior inferior angle, which has the mucro on the tip. The shape of the organ thus approaches that in *Polycirrus* and *Ereutho*. The outline, from the base of the great fang to the mucro, exhibits only a slight elevation. The ventral line likewise presents two slight elevations, instead of the usual uniform curve.

The whitish coral sand in the intestine contained a few Diatoms, many sponge-spicules, and the minute spiked spheres, formerly observed in similar sand from the Bermudas.

The *Thelepus japonicus* of Marenzeller[1] has a hook approaching the foregoing in shape.

Thelepus cincinnatus (Fabricius).

Amphitrite cincinnata, Fabricius, Fauna Groenland., p. 286.

Habitat.—Dredged in the "Knight Errant," Station 8, August 17, 1880; lat. 60° 3′ N., long. 5° 51′ W.; bottom temperature 29°·2, surface temperature 56°·5; depth, 540 fathoms.

Thelepus cincinnatus, var. *canadensis*, nov. (Pl. XXVIIIA. fig. 17).

Habitat.—Dredged at Station 48 (near Le Havre Bank, Nova Scotia), May 8, 1873; lat. 43° 4′ N., long. 64° 5′ W.; depth, 51 fathoms; surface temperature, 38°·0; sea-bottom, rock.

A specimen about 25 mm. long, and with a diameter at its widest part of nearly 3 mm.

[1] Südjapan. Annel., p. 208, Taf. ii. fig. 4.

This form differs in some respects from *Thelepus cincinnatus*. The segments as a rule are much narrower, and instead of the uniformly coarse, rugose condition of the dorsum, this new form presents distinct transverse rows of papillæ, one or two, according as the segments are or are not divided by a transverse line. The ventral scutes are less prominent than in the common species, and the entire body more smoothly rounded. The branchiæ are similar in position and structure, though, perhaps, they are a little more delicate than in *Thelepus cincinnatus*. The eye-spots and cephalic region also correspond.

The form of the setigerous processes, as well as the structure of the individual bristles, present no noteworthy differences. The uncinigerous rows, again, differ in being shorter and less prominent than in *Thelepus cincinnatus*. Each hook (Pl. XXVIIIA. fig. 17) shows a longer and more produced basal region, resembling in this respect certain varieties from Guernsey and Berwick Bay in Britain.

The greyish mud in the alimentary canal was crowded with Diatoms and sand-grains, besides a few rounded bodies probably connected with Radiolarians.

This species is characterised by the great firmness of the hypoderm and its depth along the ventral arch, especially towards the middle line. The circular coat is comparatively thin, and so are both dorsal and ventral longitudinal muscles. The nerve-trunks are small and ovoid. The oblique muscles are inserted into the circular coat above the outer part of each nerve. Numerous ova occur in the perivisceral cavity.

Thelepus? sp. (Pl. XXVIIIA. fig. 18).

Habitat.—Dredged at Station 47 (off the American coast, near New York), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; surface temperature, 42°·0; sea-bottom, blue mud.

The specimen is so softened and ruptured that little more can be attempted than a description of the bristles and hooks. It is a somewhat larger specimen than the last.

In general form it seems to correspond with *Thelepus cincinnatus*, but no eye-specks are present. The bristles of the two also agree. The hooks (Pl. XXVIIIA. fig. 18) present two distinct teeth above the great fang, and the dorsal or posterior outline is longer, the basal region is larger than in the variety *canadensis* from the more convex condition of the ventral outline, and the anterior inferior angle beneath the mucro is better developed. In most respects, indeed, there is a general divergence when the two hooks are contrasted. The precise value of these minute distinctions of course is open to criticism, but they are none the less noteworthy. The importance of attention to these characters will be appreciated when the hook of the same species figured by

Leuckart[1] is compared with those drawn by Malmgren's artist.[2] On the whole, the hooks come nearest those of the common *Thelepus* (A) at St. Andrews. So far as can be seen in the specimen, the body is more rugose and glandular than the variety *canadensis*.

The sandy mud in the alimentary canal was rich in Diatoms, fragments probably of *Challengeriæ*, and a few minute Foraminifera.

The tube is composed of clear fragments of quartz and other grains with Foraminifera, and is of the same consistence as regards the internal lining as the ordinary species.

The hooks of this form come near, though they are not identical with, those of *Thelepus triserialis*,[3] from the Mediterranean.

Thelepus marenzelleri,[4] n. sp. (Pl. XXVIIIA. fig. 19).

Habitat.—Trawled at Station 236 (off the southern shores of Japan), June 5, 1875; lat. 34° 58′ N., long. 139° 29′ E.; depth, 775 fathoms; bottom temperature 37°·6, surface temperature 66°·5; sea-bottom, green mud.

A fragment of the anterior region of a specimen about the average size of *Thelepus cincinnatus*, and resembling the common form, *Thelepus goodsiri*, from St. Andrews. The cephalic lobe bears a large number of grooved and frilled tentacles, and just behind its posterior rim are a series of very conspicuous pigment-specks. The branchiæ agree in length and position with the common form at St. Andrews. The bristles show a decidedly shorter wing on each side than in the latter, and the enlargement of the shaft near the commencement of the wings is more pronounced; indeed the entire tip is shorter, a feature very evident in both anterior and posterior bristles.

The hooks (Pl. XXVIIIA. fig. 19) show one distinct tooth above the great fang, and one or two others beyond the former. The deepest part of the dorsal inflection is nearly opposite the anterior sinus below the great fang, and is therefore high, the longer half of the line being inferior. A slight projection marks the anterior inferior angle below the mucro. These hooks thus differ from those of *Thelepus goodsiri* in the height of the crown; and instead of the inferior dorsal line being the longer, as in the form procured by the Challenger, it is the superior. They also differ from the hooks of the fragment from Station 47, which has the base much diminished toward the anterior inferior angle, a prominently convex ventral line, and a nearly central position of the dorsal inflection.

The greyish mud in the alimentary canal contained minute Foraminifera—both calcareous and arenaceous fragments of sponge-spicules, a hydroid polypary, fine spinulose circular *Challengeriæ* with their large granular masses internally, and another smaller

[1] Zur Kenntniss der Fauna von Island, *Archiv f. Naturgesch.*, Taf. iii. fig. 4, C, 1849.
[2] Nordiska Hafs-Annulater, Tab. xxii. fig. 58, D.
[3] Marenzeller, *Sitzungsb. d. k. preuss. Akad. d. Wiss.*, Bd. lxxxix. p. 208, Taf. ii. fig. 3.
[4] Named after the careful Austrian Naturalist mentioned on p. 443.

ovoid form, fragments of Radiolarians, minute Crustacea, an occasional bristle of an Annelid, peculiar pointed structures like tips of spears, and probably allied to similar organs formerly mentioned in other species, minute Nematoids (it may be those of some of the prey, *e.g.*, Pteropods), minute bodies with double disks, numerous Pteropods like *Hyalea*, from the youngest stages up to adult size, a fine *Echinoderes* like *Echinoderes dujardinii*, Clap., and finally many Diatoms and Coccoliths. The *Echinoderes* had its cephalic spines included, but pressure caused extrusion.

The specimen is enclosed in a smooth tube of somewhat brittle opalescent chitin, minutely dotted under a high power. No structure adheres to it externally, the only object, indeed, attached to it internally is an occasional hook of its own.

The uncini of the foregoing differ decidedly from those of Marenzeller's *Thelepus japonicus*,[1] in the form of the anterior inferior region beneath the mucro, and in the curve of the inferior margin.

Neottis, Malmgren.

Neottis antarctica, M'Intosh (Pl. LII. fig. 1).

Neottis antarctica, M'Intosh, Ann. and Mag. Nat. Hist., ser. 4, vol. xvii. p. 321, 1876.
Thelepus m'intoshii, Grube, Annelidenausbeute von. S.M.S. "Gazelle," Monatsber. d. k. preuss. Akad. d. Wiss. Berlin, Aug. 1877, p. 534.
Neottis antarctica, M'Intosh, Zool. Kerguel., Phil. Trans., vol. 168, p. 261, pl. xv. figs. 14, 15.

Habitat.—Dredged at Station 144A (off Marion Island), December 26, 1873; lat. 46° 48′ S., long. 37° 49′ E.; depth, 69 fathoms; surface temperature, 41°·0; sea-bottom, volcanic sand.

An example attached to a mass of *Serpula narconensis* was dredged in Balfour Bay, Kerguelen, January 9, 1874, in 20 to 60 fathoms.

Other examples come from Station 149, off Christmas Harbour, Kerguelen, January 29, 1874, in 120 fathoms.

Also from Station 150 (between Kerguelen and Heard Islands), February 2, 1874; lat. 52° 4′ S., long. 71° 22′ E.; depth, 150 fathoms; bottom temperature 35°·2, surface temperature 37°·5; sea-bottom, coarse gravel.

Two fragments were found at Station 151 (off Heard Island), February 7, 1874; depth, 75 fathoms; surface temperature, 36°·2; sea-bed, volcanic mud. One is distended with ova.

A large portion of the posterior end of the same species (so far as can be ascertained from the hooks and other parts) occurs at Station 313 (Strait of Magellan), January 20, 1876; lat. 52° 20′ S., long. 67° 39′ W.; depth, 55 fathoms; bottom temperature 47°·8, surface temperature 48°·2; sea-bottom, sand.

[1] *Op. cit.*, p. 208, Taf. ii. fig. 4.

The specimens procured by Mr. Eaton during the Transit of Venus expedition came from Royal Sound, Kerguelen, and the American investigators found it in the same locality, where it seems to be very common.

The specimens range on either side of 120 mm. in length, and the tubes are equally variable, the longer reaching 280 to 290 mm., with a diameter of 9 mm. The chitinous lining is coated with fragments of *Cellaria* (*Salicornaria*), pieces of shells, sea-weeds, and other structures. The tube found between Kerguelen and Heard Islands (Station 150) had small fragments of a blackish rock, attached to the hyaline chitinous secretion.

The fragment from the Strait of Magellan has an accessory tail attached to the side of the anus. A process on the dorsum of the anus also occurs in that from Station 151.

Many of the specimens contain numerous ova.

In regard to food, the alimentary canal of that from Balfour Bay was rich in Diatoms, peculiar rhomboidal segments, apparently attached in some cases in a linear manner to each other, and with finely pointed ends, sponge-spicules, and much organic debris. The armed rhomboidal structures are probably connected with the pointed cylinders formerly noticed. The contents of the intestine of those from Christmas Harbour abounded in very large round and other Diatoms, and massive sponge-spicules. The alimentary tract of the fragments from Heard Island contained sandy mud in which Diatoms, fragments of sponge-spicules, chitinous shreds (pertaining to an Annelid ?), and the ventral bristles of a *Harmothoë*. The greyish pulpy contents of the intestine of the specimen from the Strait of Magellan showed only a few Diatoms amongst the coarse sand-grains.

Dr. Baird's *Terebella kerguelensis*, from Kerguelen Island, whence it was procured by the Antarctic expedition, seems to be this *Neottis*. A careful examination of the softened specimen in the British Museum shows that Dr. Baird's name rightly has priority, though it would not have been possible to determine it without such aid. As no published account of the species, however, has come under notice, it has been deemed proper at present to allow the foregoing name to stand. Dr. Baird's *Terebella bipunctata*[1] is a closely allied form, with two fangs in the lateral view of the hook, as in *Neottis antarctica*. It came from the Falkland Islands in 1847. In the living form "two beautiful purple stripes run down the back." The tubes are composed of coarse fragments of stone. Kinberg's *Thelepus antarcticus*,[2] from the Strait of Magellan, may be an allied form.

The structure of the wall of the body of this species corresponds with the typical forms. Posteriorly the nerve-cords are almost circular, and are separated by a slight interval. The large alimentary canal of the region is fixed dorsally and ventrally by firm fibrous bands, and its inner surface is thrown into prominent folds.

[1] *Journ. Linn. Soc. Lond.*, vol. viii. p. 157, 1865.

[2] *Op. cit.*, 1866, p. 345.

Ereutho, Malmgren.

Ereutho kerguelensis, n. sp. (Pl. XXVIIIA. figs. 20, 21).

Habitat.—Dredged at Station 149G (off London River, Kerguelen), January 29, 1874; lat. 48° 50′ S., long. 69° 18′ E.; depth, 110 fathoms; surface temperature, 40°·2; sea-bottom, volcanic mud.

The larger example measures 30 mm. in length, with a diameter at its widest part anteriorly of about 3 mm., exclusive of the feet.

In general configuration this form agrees with *Ereutho*, Malmgren, having thirteen pairs of bristle-tufts. The frilled cephalic lobe had evidently been surmounted by a series of grooved tentacles, while inferiorly are a number of smooth ones. The dorsum anteriorly is very rugose, and the large buccal surface is almost papillose.

The bristles begin on the buccal segment, and number thirteen pairs. They are borne on setigerous processes, which correspond in length to those of the common Zetlandic form. The bristles (Pl. XXVIIIA. fig. 20) differ from those of the latter species in having shorter and less attenuate tips. Both are distinctly serrate, the points being situated on rudimentary wings, which are only indicated in certain positions by a double line at the edge of the bristle, and most distinctly marked in the Zetlandic form. Below the fifth, sixth, and seventh setigerous processes are three greatly expanded glandular areas, somewhat in the form of suckers. Moreover, each bristle-tuft is ensheathed by an anterior and posterior cuticular lamella, which terminates superiorly in a distinct papillary process, longest anteriorly. Each process is composed of cuticle and hypoderm.

The hooks (Pl. XXVIIIA. fig. 21) somewhat resemble those of *Ereutho smitti*, Malmgren, but they bear three distinct teeth, viz., the great inferior fang, and two above it. A well-marked heel exists posteriorly. The ventral outline presents a somewhat prominent convexity near the middle. The anterior inferior process is less produced than in *Polycirrus aurantiacus*, as figured by Malmgren.

The pale greyish mud in the intestine was mainly composed of Diatoms, sponge-spicules, and here and there a fragment of a Radiolarian.

The hypoderm in this species is very largely developed on the ventral arch, that is on the region below the bristle-bundles. It forms a thick, glandular, and somewhat lax investment, and there is no separation of the area outside the nerve-cords as in the common British *Polycirrus*. The dorsal arch of the hypoderm is much thinner. The nerve-cords are large and rounded, and have a fibrous sheath externally. The circular muscular layer is strong. The longitudinal ventral muscles are somewhat narrow and extended, though thicker than the dorsal, which meet in the median line. The œsophagus shows externally a thin series of longitudinal fibres, then a firm circular belt and the glandular lining. The great glands of the anterior third and ova are present in the body-cavity.

Polycirrus, Grube.

Polycirrus kerguelensis, n. sp. (Pl. XXVIIIA. fig. 22).

Habitat.—Dredged at Station 149H (off Christmas Harbour, Kerguelen), January 29, 1874; lat. 48° 45′ S., long. 69° 14′ E; depth, 127 fathoms; surface temperature, 39°·8; sea-bottom, volcanic mud.

A fragment of the anterior end of a small specimen, measuring about 5 mm. in length, and barely 1 mm. in diameter at its widest part, toward the snout.

The condition of the specimen is such that all that can be said of it is that the general aspect agrees with *Polycirrus*, and that the hooks occur well forward, a feature having the same import. In structure the bristles correspond with the same typical form, presenting a slight dilatation in the region beyond the shaft, and then diminishing toward the tip, which is minutely serrated as in *Ereutho*.

The hooks (Pl. XXVIIIA. fig. 22) possess three teeth, the great fang and two above it. The anterior inferior angle is much produced, forming a long process with a slight curve upward. The angle made by the great fang with the latter is large. The hook approaches that of *Polycirrus aurantiacus*, though, judging from Malmgren's figure, the species from Kerguelen has a longer basal region. It diverges in the same manner from the *Polycirrus nervosus* of Marenzeller from Southern Japan. The absence of the minute characters of the hooks in Grube's *Polycirrus boholensis* from the Philippines prevents definite diagnosis. The hook, again, of *Polycirrus hæmatodes*, Claparède,[1] especially as shown by Langerhans[2] (since Claparède's figure is too small for accuracy) from Madeira, is closely allied.

Ehlersiella,[3] n. gen.

Ehlersiella atlantica, n. sp. (Pl. XXVIIIA. figs. 26, 27).

Habitat.—Trawled at Station 63 (Mid Atlantic, between Bermuda and the Azores), June 19, 1873; lat. 35° 29′ N., long. 50° 53′ W.; depth, 2750 fathoms; surface temperature, 71°·0; sea-bottom, red clay.

Also dredged at Station 76 (off the Azores), July 3, 1873; lat. 38° 11′ N., long. 27° 9′ W.; depth, 900 fathoms; bottom temperature 40°·0, surface temperature 70°·0; sea-bottom, Pteropod ooze.

From the first-named Station several fragments of the posterior region of this somewhat small species were procured, measuring 11 mm. in length and about 1 mm. in

[1] Glanures, p. 25, pl. ii. fig. 1β. [2] *Zeitschr. f. wiss. Zool.*, Bd. xl. p. 265, Taf. xvi. fig. 26.

[3] Named in honour of Prof. Ehlers of Göttingen, whose laborious and valuable researches amongst the Annelids are well known.

diameter at their widest part. From the second Station an injured fragment of the anterior region, apparently of the same species, was obtained, and thus further information concerning the structure of the species was gained.

The fragment of the anterior region somewhat resembles an example of the Ampharetidæ from the great development of the lateral bristles, but the presence of a pair of branchiæ with branched extremities is at variance with the features of this group. The cephalic region appears to be broad, with two rounded lateral masses and a central depression. The branchiæ are narrower at the base than superiorly, the broad tip splitting into several short branches. The segments of the body seem to be narrow, judging from the closely approximated series of long pale golden bristle-tufts. The bristles (Pl. XXVIIIA. fig. 26) lean rather to those of the Terebellidæ than of the Ampharetidæ, though there is less that is characteristic in them than in the hooks. Their shafts are straight, elongate, and often granular internally, apparently from a change in the inner wall of the chitin. The tips are slightly curved, and furnished with rather well-developed wings below the very finely tapered extremities. The shorter forms show the latter feature best, but their wings are not more developed than in the longer forms. There are upwards of fourteen pairs in the specimen, and the series is incomplete.

The fragments from Station 63 show that the posterior region of the body corresponds with that in the Terebellidæ, but also has alliances with certain of the Ampharetidæ, especially *Grubianella*, since it is terminated by a distinct enlargement, about the length of three of the preceding segments. The anus, moreover, is surrounded by a series of long papillæ, and two truncated processes occur on what seems to be the ventral surface, and which may have given origin to long styles.

The hooks (Pl. XXVIIIA. fig. 27) differ from those of any other known genus, combining certain of the characters of *Melinna* with those of *Artacama*. Two very distinct teeth occur above the great fang, and a third and fourth are partially seen superiorly. The great fang is very large, but the sinus beneath it is narrow. The mucro in the latter is prominent, and the notch above the anterior inferior process is deep. The heel is slightly developed, and the ventral margin forms a uniform convexity.

In the œsophagus of the example from Station 76 is a little greyish mud containing many minute *Globigerinæ*, a few fragments of sponge-spicules and *Challengeriæ*, Coccoliths, and other debris.

The specimens from Station 63 occurred in tubes having a tough, hyaline chitinous internal lining, and an external coat of grey mud, which clings with considerable tenacity to the former. The amorphous mud shows many fragments of silex, which cause translucent dots in the masses when viewed by transmitted light. It is possible that some of the rounded masses are connected with arenaceous Foraminifera, but this is uncertain.

This form comes nearest *Grubianella* in regard to the anal enlargement.

Œstrella levinseni,[1] n. gen. et sp. (Pl. XXXIXA. fig. 11).

A curious Crustacean parasite occurs on the posterior fragment (Station 63). It consists of a somewhat ovate body rounded anteriorly, but presenting two prominences posteriorly and two ovisacs. The anterior region or cephalo-thorax is bevelled from above downward and backward ventrally, while dorsally a kind of collar clasps the anterior part of the snout. Two segments follow, the first and somewhat broader being marked by a transverse furrow. A narrow segment succeeds, its median region being carried forward in an angular manner. Posteriorly are two rounded lateral prominences for the attachment of the ovisacs. The tube containing the fragment of the Annelid showed three ovisacs, so that it is probable another example of the parasite existed.

Artacama, Malmgren.

Artacama challengeriæ, n. sp. (Pl. LI. fig. 6; Pl. XXVIIIA. figs. 23*a*, *b*, 24, 25).

Habitat.—Dredged at Station 149, in several localities, *e.g.*, in Betsy Cove, lat. 49° 8′ S., long. 70° 9′ E., at a depth of 40 fathoms; off Royal Sound, lat. 49° 28′ S., long. 70° 30′ E., in 25 fathoms; off Cape Maclear, January 21, 1874, in 30 fathoms; and a fragment off London River, in 110 fathoms.

Specimens measure 75 mm. in length, with a diameter at the large part in front of 8 mm.

In the character of the cephalic region, body, and number of the bristle-tufts, this form corresponds with *Artacama proboscidea*, Malmgren. The bristles (Pl. XXVIIIA. figs. 23*a*, *b*) agree very closely with the figures given by Malmgren, but differ from the Canadian forms in having a shorter tip, the terminal region being much more attenuate in the latter, and the wings narrower. The bristles are also pale in the present form. The broader wings in the new species are as evident in the longer (*a*), as in the shorter series (*b*).

The hooks, again (Pl. XXVIIIA. fig. 24), present a different structure from those figured by Malmgren (*Artacama proboscidea*), so that, unless we are to suppose serious inaccuracy in these figures, the forms seem to diverge. In that procured by the Challenger, four teeth at least occur in one series above the great fang, and there are traces of a fifth. The great fang is largely developed, so that the crown appears small in comparison with it, whereas in Malmgren's figure the crown is high and the great fang small. A well-marked mucro projects from the margin below the fang, while in

[1] After G. M. R. Levinsen of Copenhagen, the author of various papers on the Annelida, and especially of an excellent one entitled Om nogle parasitische Krebsydr, der snylte hos Annelider, *Vidensk. Meddel. f. d. nat. Foren. i Kjøbenhavn*, 1877.

the figure given by Malmgren the outline is unbroken. The ventral margin also diverges in the two forms, presenting in the new species an undulating outline, whereas the northern form appears to have only a uniform and slight convexity. In the other, and perhaps average series (Pl. XXVIIIA. fig. 25), the characters are less bold, but the general outline, the presence of the mucro, and the shape of the anterior inferior process at once distinguish it from Malmgren's representation. The hooks of the Canadian form closely agree with the latter series. The rows of hooks from the seventh to the sixteenth are double, as in the ordinary form. Four prominent papillæ occur on each side (from the second hook-row to the fifth) between the latter and the setigerous process.

The lobules or lamellæ above the posterior hooks differ slightly from those of the Canadian form, the anterior being decidedly smaller, the first two especially being rudimentary, whereas in the latter they are large and reniform. Their condition in Malmgren's form is doubtful.

The anus is minutely papillose.

The alimentary canal of those from Betsy Cove contained somewhat coarse sand, showing multitudes of fragments of silex and sponge-spicules, a few minute spines of Echinoderms, minute ova, fragments of Radiolarians and Diatoms. That from Royal Sound exhibited finer sand, sponge-spicules, and Diatoms in great abundance; while the food of those from Cape Maclear resembled the first. In the alimentary tract of the fragment from London River, Diatoms and sponge-spicules alone were conspicuous.

The example from Royal Sound had beside it a large friable tube of muddy sand. The internal secretion is so slight that it falls to pieces on interference. Its connection with the specimen is open to doubt.

The species seems to be very frequent in Kerguelen waters, and Kinberg mentions others from the neighbourhood of Rio de Janeiro.

While the hypoderm is somewhat thinner than in the foregoing genus, the muscular layers are more powerful. This is especially marked in both dorsal and ventral longitudinal muscles, which form massive plates in each case. The nerve-area is bounded externally by a comparatively thin layer of hypoderm, and rests against the circular coat internally, the oblique muscles being inserted above its outer borders.

Artacama zebuensis, n. sp. (Pl. LI. fig. 7; Pl. XXIXA. figs. 1, 2).

Habitat.—Trawled at Station 209 (off Zebu, one of the Philippines), January 22, 1875; lat. 10° 14′ N., long. 123° 54′ E.; depth, 95 fathoms; bottom temperature 71°·0, surface temperature 81°·0; sea-bottom, blue mud.

The specimen is incomplete posteriorly, but measures 70 mm. in length, with a diameter anteriorly of 4·5 mm.

In the general form of the body it agrees with the preceding species. The cephalic tentacles, however, are much more delicate and filiform. The branchiæ likewise are somewhat finer and more numerous, forming three dense wavy masses on each side. The proboscis has much more minute and more numerous papillæ; and the furrows on the buccal segment are more regular and symmetrical.

The bristles (Pl. XXIXA. fig. 1) are somewhat longer than in the preceding species, and the tips are much more attenuate and tapering. The wings, moreover, are narrower, and show very distinctly the oblique striæ, frequent in such forms. The shafts are straight, but the tips are slightly bent. The tufts are decidedly larger than in the former species, both as regards the setigerous processes and the number of the bristles.

The hooks (Pl. XXIXA. fig. 2) differ from those of the preceding form (*Artacama challengeriæ*) in the more pronounced prominence of the heel, in the deeper inflection beneath it, and in the smaller incurvation just below the anterior inferior projection. The distance between the base of the great fang and the point of the mucro is greater in the present than in the former species, and the incurvation below it is also deeper. The crown is somewhat less elevated and more pointed than in *Artacama challengeriæ*, the base of the hook is longer, and quite different in character from that in the species referred to.

Another evident distinction between this form and *Artacama challengeriæ* is the diminution of the lamellæ on the posterior setigerous processes. They are hardly noticeable in the first four or five, and at no part of the animal do they surpass in size the setigerous process. When fully developed they form somewhat ovoid structures attached to the upper end of the setigerous lamellæ. Some in front are pointed distally, but their softened state renders the description somewhat unsafe.

The intestine contains a large amount of dark greyish mud, in which sponge-spicules, spines of an Annelid, Foraminifera of various kinds, minute spiral shells of Pteropods, Diatoms, and hairs of minute Crustacea occur amongst the sand-grains and debris.

The size of the muscles exceeds that in *Artacama challengeriæ*. The longitudinal dorsal being nearly twice the bulk of the ventral in section. The long median fissure between them is occupied by the suspensory fibres of the alimentary canal. The oblique muscles are conspicuously powerful, and a depression occurs at each raphe in contraction. The nerve-area is similar to that in the former species, though somewhat less.

Terebellides, M. Sars.

Terebellides strœmi, M. Sars, var. (Pl. XXIXA. figs. 3–6).

Terebellides strœmi, Sars, Beskrivelser og Jagttagelser, &c., p. 48, Tab. xiii. fig. 31, 1835.

Habitat.—Dredged at Station 47 (off the American coast, near New York), May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; surface temperature, 42°·0; sea-bottom, blue mud.

An elongated example, measuring about 70 mm., and scarcely reaching 3 mm. in diameter in front at its widest part.

It agrees with the ordinary *Terebellides strœmi*, M. Sars, in general appearance, the only difference being the great length of the posterior region (behind the bristles), no less than fifty-two uncinigerous processes occurring on each side. The bristles are perhaps a little shorter and less attenuate than in a typical *Terebellides strœmi* from Norway. The anterior hooks (Pl. XXIXA. fig. 3) present a more distinct enlargement of the head, and a more decided constriction of the neck, features at once apparent on contrasting the former figure with the drawing of a hook from a large Norwegian example (Pl. XXIXA. fig. 5). The posterior hooks, again (Pl. XXIXA. fig. 4), differ in having the posterior curve less convex, and the anterior inferior angle less produced than in the Norwegian type (Pl. XXIXA. fig. 6). It is of course doubtful whether these slight differences indicate more than mere variation, but they are worthy of careful attention.

The greyish sand in the alimentary canal presents only a few sponge-spicules, one or two Diatoms, and Coccoliths.

The structure of the body-wall agrees with that in the British form. It differs from the type of the previous genera in having the nerve-cords within the circular coat.

The number of segments is an uncertain feature, though the proportion of the bristled to the others is of course more reliable. This species ranges from the European to the American shores.

Terebellides strœmi, M. Sars, var. *Keryuelensis* (Pl. XXIXA. figs. 7, 8; Pl. XXXVIIIA. fig. 4).

Habitat.—Dredged at Station 149G (off London River, Kerguelen), January 29, 1874; lat. 48° 50′ S., long. 69° 18′ E.; depth, 110 fathoms; surface temperature, 40°·2; sea-bottom, volcanic mud.

The specimens are less than the preceding, the longest measuring 38 mm., with an anterior diameter of 3 mm.

There is little external difference between these and Norwegian forms, except,

perhaps, the somewhat finer tentacles. The posterior region has upwards of forty segments.

The bristles present no feature distinctive from those of Station 47. The anterior hooks, however (Pl. XXIXA. fig. 7), have a more abrupt distal dilatation than in the form just mentioned. The posterior uncini, on the other hand (Pl. XXIXA. fig. 8), closely approach those of the American form.

The greyish mud in the alimentary tract showed numerous Diatoms and sponge-spicules, but only a few Foraminifera.

From the same Station (149H—off Cumberland Bay), January 29, 1874, in 127 fathoms, several examples occur which agree with the typical form from Norway, both in regard to anterior and posterior hooks. It is true there are slight differences in the curvature of the ventral lip anteriorly, but if such variations be allowed for separation of the species is unnecessary.

Those from London River had tubes of soft greyish mud.

The contents of the intestine of this form agreed with the preceding, but no Foraminifera were visible.

The soft greyish mud composing the tube of an example presented similar microscopic features, the only additions being one or two minute Foraminifera and bristles of Annelids.

The sections of the anterior third of this form, as in the other examples of *Terebellides strœmi*, are chiefly remarkable for the beauty and complexity (Pl. XXXVIIIA. fig. 4) of the central apparatus. The hypodermic and muscular layers are comparatively thin, and the united nerve-cords form a large mass in the ventral median line. The whole of the body-cavity of the region is occupied by the folds, seven or eight in number on each side. Each of the lamellæ is double, a median septum indicating the apposition of the loops. The long folds are external, and the smaller are central and just above the area occupied by the gullet. Each loop is complete, that is, forms a continuous circuit, and it is the junction of the sides of adjoining loops that causes the septum and the double aspect. The ends of the flattened loops are, on the other hand, composed of a single fold. The whole apparatus resembles a series of branchial arches or the condition in *Balanoglossus*. The tissue has a firm external boundary, and consists of glandular substance arranged in a linear manner as in the alimentary lining. A section of the œsophageal region occurs in the middle of the folds a little above the ventral edge.

Terebellides? sp. (Pl. XXIXA. figs. 12, 13).

Habitat.—Dredged at Station 169 (off the north-east point of the North Island of New Zealand), July 10, 1874; lat. 37° 34′ S., long. 179 22′ E.; depth, 700 fathoms; bottom temperature 40°·0, surface temperature 58°·2; sea-bottom, blue mud.

A small example, measuring 18 mm. in length, and having a diameter of 1·2 mm. anteriorly.

There is little in external appearance to distinguish it from the common species, and the softened condition of the cephalic region renders any remarks on the cutaneous folds somewhat uncertain. No divergence is apparent in regard to the branchiæ. Very few bristles remain, but, so far as observed, no diagnostic feature is noticeable in their structure. The anterior hooks (Pl. XXIXA. fig. 12) have rather a large crown, and the series of teeth above the great fang is unusually developed, the points projecting forward over the base of the latter, so as to resemble in this respect the specimens from Station 47.

The posterior hooks, again (Pl. XXIXA. fig. 13), are furnished with two or three teeth above the great fang, but it is doubtful whether that immediately over the latter be not one of the duplicate series, for it is encroached on by the bases of the great fang below, and the smaller tooth above it. Their minuteness renders the differences in the outline of the base, and in the sinus below the great fang, less precise as a means of diagnosis.

The fine sandy mud in the intestine showed a few Diatoms and sponge-spicules, but organisms were rare.

The structure of the body-wall is similar to that in the foregoing.

The relation of this form to Kinberg's *Terebellides sieboldii*,[1] from Banks Strait, is uncertain. There is little that is really diagnostic in the description of the Swedish author.

Terebellides ehlersi, n. sp. (Pl. LI. fig. 8; Pl. XXIXA. figs. 9–11).

Habitat.—Dredged at Station 174D (a little south of the Fiji group), August 3, 1874; lat. 19° 5′ S., long. 178° 16′ E.; depth, 210 fathoms; surface temperature, 77°·7; sea-bottom, coral mud.

The specimen is of average size, measuring about 35 mm. in length, and having an anterior diameter of 2·2 mm.

In external appearance it corresponds with the foregoing forms, except that the relative sizes of the anterior and posterior divisions greatly differ. The anterior (or external) pair, as in some European examples, are only a little larger than the posterior, and they do not send an inferior process downward in front. The whole branchial apparatus is much smaller than in *Terebellides stræmi*, and the lamellar processes are much diminished. In consequence of this structure the four appendages are borne upward in an erect and separate condition.

The bristles (Pl. XXIXA. fig. 9) are somewhat stouter than in the Norwegian species,

[1] *Op. cit.*, 1866, p. 346.

and they show a more distinct wing at each side than in any of the previous forms, while the shaft has also a deeper yellowish hue by transmitted light.

The anterior hooks (Pl. XXIXA. fig. 10) diverge from any species hitherto observed in the shortness and marked definition of the neck. The inward curve of the posterior outline is very decided, marking off the distal enlargement and the shoulder of the hook as in the Maldanidæ. Anteriorly, also, the outline presents a slight inflection above the shoulder.

The posterior hooks (Pl. XXIXA. fig. 11) only slightly differ from the foregoing forms. In most views two large teeth occur above the great fang, but these are not clearly defined in others, as the duplicate series intrude themselves in the line of vision. It is, indeed, a doubtful point to estimate the precise number of teeth that should be figured in a profile view of these hooks. The outline below the great fang (*i.e.*, from its base to the anterior inferior projection) also differs in this species from any of the foregoing. The differential characters of these organs are thus somewhat fine.

The food in the alimentary canal consisted of a whitish mud in which a few minute *Globigerinæ* and other Foraminifera, many of the spiked solid circular bodies observed in the coral sand from Bermuda and elsewhere, a few minute Pteropods, and sponge-spicules occurred.

The structure of the body-wall is typical. The proboscidian region has been everted, yet it is filled with muddy debris.

Kinberg's *Terebellides pacifica*,[1] from the Society Islands, may be this species. His description, however, is devoid of the minuteness necessary for recognition. In the *Terebellides ypsilon*, Grube, from the Philippines, the teeth of the hook are more numerous, viz., four above the great fang.

Family Sabellidæ.

The number of species representing the family is considerable, viz., fifteen, and of these the majority are new.

Schmarda gives eight species, chiefly littoral, and he does not discriminate between *Sabella* and *Dasychone*. Kinberg describes seventeen, the largest number procured in former voyages. Grube again has only four from the cruise of the "Gazelle," while he has twelve new forms in the account of the collection made by Semper in the Philippines. No example occurred in his Annulata Œrstediana. Ehlers mentions four from the "Porcupine," one of which, the common *Sabella pavonina*, reached the depth of 725 fathoms.

The majority of the Challenger forms had been procured between tide-marks or in shallow water, the former series at places where opportunities for shore-collecting seem

[1] *Op. cit.*, 1866, p. 346.

to have been ample, as at the Bermudas and the Cape. A single example only comes from a depth of 600 fathoms, off the South American coast. The absence of *Chone* and *Euchone* from the collection of the Challenger is noteworthy.

Claparède and others group this family with the Serpulidæ, though the presence of a thoracic membrane covered with vibratile cilia characterises the latter.

Langerhans, in his remarks on the Sabellidæ of Madeira,[1] gives a careful classification of the genera based on the occurrence of one or two rows of hooks in the thoracic region. *Sabella*, again, is distinguished from *Potamilla* by the presence of only one kind of thoracic bristles, the latter having two kinds.

Potamilla, Malmgren (*Sabella*, Linnæus).

Potamilla torelli, Malmgren (Pl. LIII. fig. 2; Pl. XXIXA. figs. 16–19).

Potamilla torelli, Malmgren, Nordiska Hafs-Annulater, p. 402; and Ann. Polychæta, p. 114, Tab. xiii. fig. 76.

Habitat.—Dredged at Station 49 (south of Halifax, Nova Scotia), May 20, 1873; lat. 43° 3′ N., long. 63° 39′ W.; depth, 85 fathoms; bottom temperature 35°·0, surface temperature 40°·5; sea-bottom, gravel and stones.

Length about 60 mm., and with a diameter of 2·5 mm. anteriorly.

The body is somewhat flattened dorsally and ventrally, especially posteriorly, where it is also tapered. The dorsal collar presents an anterior or inner sausage-shaped fold on each side, and a thinner posterior part which is not drawn to a point, but is slightly frilled in the preparations. This is continued straight to the ventral mesial line without a break, then forms a prominent triangular process on each side, a fissure intervening. A deep dorsal depression occurs between the frilled edges, but it is not continued farther backward than the second or third bristle-tuft. The anterior region of the body consists of eight segments, though occasionally there are only seven. The ventral median line divides the scutes from the tail forward to that behind the anterior region. It bends slightly to the right in the next posterior (making the divisions of the scute asymmetrical), then cuts off the right corner of that immediately behind the anterior region (ninth bristled segment) and disappears. A faint dorsal line exists anteriorly, but it is not depressed.

The branchiæ on each side are from thirteen to fourteen in number, and, as usual, they are gracefully coiled in the tubes. So far as can be ascertained from the spirit-preparations, they seem proportionally long. Some are pale at the base and light brown at the tip: others present pale rods and pale brownish pinnæ throughout, the

[1] *Zeitschr. f. wiss. Zool.*, Bd. xxxiv. p. 111, 1880.

tint being deepest toward the tip, which distally is very short and slightly attenuate. So short is the naked apical region that in some it is difficult to distinguish. No trace of pigment-bar or spot occurs on the main radioles. The tentacle on the dorsal surface is very short, forming a pointed lanceolate process at the edge of each fan. A short secondary process, less free than the foregoing, occurs on each side externally. Both are connected with the first radiole or rib of the side. The inner or longer is shorter than the diameter of the body. On the ventral surface, again, where the tentacle is easily seen in *Sabella pavonina*, there is only a folded process, which bends downwards externally at the tip, and becomes attached to the web at the base of the three or four ventral radioles.

The first bristle-bundle occurs dorsally as usual, immediately behind the collar, and has no hook-row. The anterior bristles, which throughout have a pale yellow colour, are arranged in two conspicuous groups in each tuft. Eight or ten elongate bristles, with more attenuate tips (Pl. XXIXA. fig. 16), form the dorsal series. Beneath is a much larger group, with tips so expanded that they are paddle-shaped, with a slender median prolongation (Pl. XXIXA. fig. 17). The shafts of these, which are slightly constricted below the tips, are stouter than those of the foregoing. Both groups form a diminishing series, as regards lateral projection, from above downward. The posterior bristles are uniform in structure throughout, though two varieties are apparent, the one, however, passing insensibly into the other. Thus the anterior tufts of the posterior region present a somewhat alternate longer and shorter series, the longer having broader wings than the anterior dorsal, the shorter being longer and narrower than the anterior ventral. Towards the caudal region of the Annelid, again, both series have their tips greatly elongated (Pl. XXIXA. fig. 18).

The seven uncinigerous rows of the anterior region occupy prominent ridges situated between the bristle-tufts and the ventral scutes, only a short interval separating them from each of the foregoing. The last two are decidedly shorter. The hooks of these anterior rows have a somewhat pointed crown, with a series of fine serrations (Pl. XXIXA. fig. 19). The breast or anterior curve is bold. The posterior process is rather long, and both it and the body below the crown are finely striated, the lines generally being continuous. The short bristles, with oar-like tips, accompanying the hooks, present no diagnostic feature. The posterior uncini have a longer neck, and the anterior curve is less prominent, but otherwise they correspond with the anterior.

The tip of the body presents a somewhat prominent terminal anus, the folds of which exhibit a little reddish pigment.

The fine muddy sand in the alimentary canal shows Diatoms, Radiolarians, and a few sponge-spicules, with hairs of minute Crustacea.

The species inhabits a tube composed of closely aggregated and minute grains of

sand, cemented by the usual secretion. Moreover, the spirit-preparations of the animals are often more or less fixed to the tube, so that it is impossible to remove them without laceration. The same secretion, therefore, is probably exuded, and fixes the body of the animal to the tube before death. The tubes are of moderate length and firmness, and some have here and there a fragment of a minute shell or tube of *Spirorbis*. They are on the whole more slender than the average examples of *Sabella pavonina*, and, besides, so far as observed, are almost entirely composed of sand. The tube is somewhat brittle, and the cement is quite transparent, so that the shapes and colours of the sand-grains are quite apparent from the internal surface. Stimpson mentions that his *Sabella pavonina* possessed such tubes.

The hypoderm in section forms a comparatively thin coating, except in the median ventral region. The circular muscular coat is also thin. It appears to touch the nerve-cords at intervals, and again to be separated by a considerable depth of hypodermic tissue, which extends between the longitudinal ventral muscles. The nerve-cords are situated at the inner edges of the latter, and have a small neural canal superiorly. The ventral blood-vessel lies in the median line above them, and a few longitudinal fibres occur in the intermediate space. A firm investment of the ventral longitudinal muscles passes down over each nerve-cord to the median line. The longitudinal dorsal muscles are clavate, with the bulbous and often prominent end inferior, while superiorly the suspensory fibres of the alimentary canal arise from the hyaline basement-tissue in the middle line. Inferiorly a strong band fixes it to the central line between the nerves.

Posteriorly (about a quarter of an inch from the tip of the tail) the longitudinal ventral muscles are greatly diminished, the dorsal are considerably increased in size, and the oblique muscles become more evident. The neural canals are indistinct, and the intestine is much reduced in size. The hypodermic pad on the ventral surface shows a median fissure.

This species seems to have a wide range, stretching from the northern shores of Europe to America, and southward to Madeira, where it was found by Langerhans.

Hansen describes a *Potamilla* (*Potamilla malmgreni*) from the North Atlantic, in which the hooks have a peculiar elongated stem. One of his figures[1] certainly deviates from anything hitherto seen in the group.

A common American species is *Potamilla oculifera*, Leidy, readily distinguished from the foregoing by its pigment-spots on the radioles. Verrill, indeed, following Malmgren, thinks it may be identical with the European *Potamilla reniformis*, O. F. Müller, a form near *Sabella saxicava*.[2] The *Potamilla tortuosa*, Webster,[3] which was found living in colonies in tortuous galleries excavated in compact shells,

[1] *Op. cit.*, Tab. vii. fig. 26.

[2] Grube, Bemerkungen über Annel. des Pariser Museums, *Archiv f. Naturgesch.*, Bd. xxxvi., 1870, p. 350.

[3] Trans. Albany Institute, vol. ix., 1879 (advance copy), p. 65, pl. x. figs. 149–153.

lined with a delicate membrane which projects from 6 to 10 mm., is probably the last mentioned species (*Sabella saxicava*).[1]

Sabella zebuensis, n. sp. (Pl. LII. fig. 2; Pl. XXIXA. figs. 20–22).

Habitat.—Dredged at Station 209 (off Zebu, one of the Philippines), January 22, 1875; lat. 10° 14′ N., long. 123° 54′ E.; depth, 95 fathoms; bottom temperature 71°·0, surface temperature 81°·0; sea-bottom, blue mud.

A somewhat flattened species, the longer fragment measuring about 85 mm., of which, however, about 40 mm. belong to the branchiæ. The diameter anteriorly is about 4·5 mm.

The body is rounded dorsally and flattened ventrally, and, with the exception of a minute blackish dot a little above each bristle-tuft in the posterior region, is devoid of pigment. Only a slightly elevated broad ridge occurs on each side of the dorso-cephalic groove, the collar ceasing at each side a little within the first bristle-tuft. It proceeds ventrally from the latter point as a prominent lamella, and ends on each side of the ventral fissure in a conspicuous lappet, thin at the extremity, but massive at the base. The anterior part of the dorsum presents a peculiarly streaked appearance, apparently from the perivisceral corpuscles shining through the translucent integuments, some of these bodies or aggregations of them assuming a stellate aspect. Ventrally the median line (*sulcus abdominalis*, M. Sars) passes forward, in one to the posterior part of the second scute, in the other to the scute behind the anterior region. The first scute has an excavation anteriorly on each side of the median line.

The branchiæ are remarkably long, and amount to twenty-two or twenty-three on each side. They are pale in the preparation, with the exception of a deep brown band of considerable breadth at each side dorsally below the basal web. It forms thus a conspicuous mark. The pinnæ are very slender, so that the branchiæ are remarkably soft and delicate, spreading out in the spirit somewhat like moist cotton. Toward the tip of each radiole the pinnæ diminish, first to short blunt papillæ, and then to mere crenations of the inner edge. The radioles terminate in long slender filiform extremities.

The two tentacles are comparatively short, and have the form of tapering grooved organs.

On each side of the mouth, and just above the median ventral flaps, is a sac-like diverticulum, the cavity of which communicates with the mouth. It is therefore a labial pouch.

[1] Compare with *Ann. and Mag. Nat. Hist.*, ser. 4, vol. ii. pl. xx. figs. 5–8, 1868.

In one example (viz., that having no ventral furrow in this part) the anterior region has eight bristle-tufts, and in the other ten pairs of bristles occur. The dorsal group in each tuft consists of elongated bristles (Pl. XXIXA. fig. 20) with narrow wings and tapering tips; while the inferior have short tips with broader wings (Pl. XXIXA. fig. 21). The extremities are hardly broad enough to lie flat, and hence are generally seen in profile, as in the figure. Similar proportions exist in the posterior group, though the tips of both kinds are much attenuated.

The anterior uncinigerous rows do not fill the space between the bristle-bundles and the ventral scutes so completely as in *Potamilla*, a considerable interval occurring next the scutes. The hooks (Pl. XXIXA. fig. 22) present a boldly marked dorsal convexity, a distinctly serrated and long crown which encroaches on the base of the great fang. The posterior basal projection is short, and the majority present a slightly downward curve at the tip. The basal or ventral line is inflated in front of the foregoing curvature. The body of the hook is more or less striated. Those near the tip of the tail present a somewhat shorter base, and the serrations on the crown are more evident.

Amongst the fine mud in the alimentary canal are a few Diatoms, fragments of sponge-spicules, minute *Globigerinæ* and other Foraminifera.

No tube is present.

The body-wall in the anterior third agrees in the main with that of *Sabella pavonina*. The hypodermic pad has a deep median fissure, and, as in the species mentioned, a canal. Moreover, small blood-vessels appear in the basement-layer beneath the hypoderm.

Sabella assimilis, n. sp. (Pl. XXIXA. figs. 23–25).

Habitat.—Dredged at Station 320 (off the South American coast, near Buenos Ayres), February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom temperature 37°·2, surface temperature 67°·5; sea-bottom, green sand.

The specimens are small, reaching about 30 mm. in length and 1·5 mm. in diameter anteriorly.

The body presents the ordinary shape, the ventral furrow proceeding forward to the second scute behind the anterior region, which (scute) it splits to the right of the median line. No furrow occurs on the dorsum. The cephalic collar anteriorly has dorsally a somewhat long triangular flap on each side, then it diminishes toward the ventral border, which it barely touches before disappearing. The number of segments in the anterior region is variable, one example showing seven, the other eight.

The pale branchiæ are proportionally long, and the radioles are devoid of any dorsal

appendage. They show the transverse articulations or cell-like divisions of the stem very distinctly. The pinnæ are long and slender, but diminish in size below the attenuate and bare tip. No closely set rudimentary series exists, as in some of the other forms, below the commencement of the terminal process. On each side is a bifid and comparatively short tentacle, the basal region being broad and the divisions filiform.

The anterior tufts present dorsally a few bristles with bent tips and a well-marked wing (Pl. XXIXA. fig. 23). The tip is only moderately lengthened. The inferior series is formed of paddle-shaped bristles (Pl. XXIXA. fig. 24) with a slender median prolongation. The posterior bristles, as usual, are distinguished by the proportionally elongated tips.

The hooks (Pl. XXIXA. fig. 25) have the crown directed forward, so that the dorsal convexity is marked. The anterior inferior projection or "breast" is much less bulky than in *Sabella zebuensis*, and there is no noteworthy convexity in the ventral line. The anterior inferior curve is thus more acute than in the previous forms.

The contents of the intestine are a few Diatoms, and a peculiar translucent fluted dotted shell of unknown relations, with sandy mud.

Both examples are fixed to the test of an Ascidian, and possess somewhat hard chitinous tubes, strengthened anteriorly by minute grains of sand and an occasional sponge-spicule or calcareous articulated fragment. The test of the Ascidian is also coated with sand and mud, and has in addition filamentous processes of secretion and sand as in *Pelonaia*.

The hooks of Dr. Baird's *Sabella occidentalis*, from St. Vincent, West Indies, somewhat resemble those of this form, but the dorsal curve differs inferiorly, and the coloration of the branchiæ also diverges.

Sabella bipunctata, Baird (Pl. LII. fig. 4; Pl. XXXA. figs. 1–3).

Sabella bipunctata, Baird, Journ. Linn. Soc. Lond., vol. viii. p. 158.

Habitat.—Found between tide-marks at St. Thomas, West Indies, March 23, 1873.

A small specimen, measuring about 26 mm. in length, including the branchiæ, which extend to 8 mm. The diameter anteriorly is about 3 mm.

The body is somewhat broad and flattened in front, and tapered from before backward. A purplish-brown spot occurs at the base of each foot dorsally and ventrally, with the exception of the ventral series of the anterior region. The pigment in the latter is in the form of a band along the anterior margin of each hook-row, thus giving a marked character to the region. The dorsal surface of the body presents a furrow, but none exists on the ventral aspect.

The cephalic region dorsally has a median furrow, on each side of which is an elevation or crest with a purplish-brown speck. The collar commences opposite the second bristle-bundle, and the lamella is coloured purplish-brown from this point forward

to the indentation facing the first bristle-bundle. The collar then forms a prominent ridge down to a line opposite the ventral scute, where a deep fissure occurs. This part is marked at the base internally by purplish-brown pigment. The central region is occupied ventrally by two lamellæ, each ending internally in a thickened process, the margins being purplish-brown.

The branchial appendages number about fourteen on each side. Each consists of a somewhat soft external radiole with a regular series of rather long pinnæ, a pigment-spot apparently between each at the base giving the arrangement a characteristic appearance. Each radiole, moreover, has about three pairs of large pigment-spots (ocular-spots) externally, and in many cases is flattened toward the tip, so that the ocular-spots are wide apart, while in others it is frilled and grooved. In some the spots occur near the bare extremity, which is short and slightly tapered. The ocular-spots show no lenses.

A single tentacle exists on each side, and it is about a third the length of the branchiæ, not much attenuated, though tapered from base to apex.

The anterior region consists of twelve segments, *i.e.*, there are twelve bristle-tufts. These show dorsally a series of longer bristles with comparatively short tips (Pl. XXXa. fig. 1) and indistinct wings. The shorter series, again (Pl. XXXa. fig. 2), have a much broader wing on each side, but on the whole they have less expanded extremities than in many other species. Both show well-marked serrations along the edge of the wing. In the posterior region of the body both kinds present the usual elongation of the tips.

The hooks (Pl. XXXa. fig. 3) present a well-arched neck, and the crown has comparatively few teeth (about five) above the great fang. The anterior basal region or "breast" is large and rounded, this and the posterior prolongation being proportionally broad, while the neck below the crown is narrow. The striæ on the neck and body are almost rectilinear. The posterior hooks show more distinct teeth above the great fang—the normal condition.

The pellets in the intestine presented a few fragments of sponge-spicules, fragments of Algæ and Polyzoa, with an occasional Diatom.

The body-wall is typical, the only appreciable differences, in comparison with *Sabella pavonina*, being the somewhat greater extent of the longitudinal dorsal muscles, and the smaller size of the neural canals. As usual, the cords are more widely separate in the interganglionic regions.

No tube is present in the collection of the Challenger. In the British Museum, however, the tubes (which, as Dr. Baird states, are about the size of a swan-quill) are numerous. They consist of a firm chitinous lining covered externally with greyish mud anteriorly. Posteriorly the more slender chitinous tube has small stones and gravel externally, so as to compensate for its more flexible condition. The specimens are much larger than those collected by the Challenger. Dr. Baird's specimen had purplish pigment toward the base of the branchiæ.

? *Sabella fusca*, Grube (Pl. LII. fig. 3; Pl. XXXa. figs. 4–6).

Sabella fusca, Grube, Annel. d. rothen Meeres, Monatsber. d. k. preuss. Akad. d. Wiss. Berlin, June 1869, p. 36 (sep. Abd.).

Habitat.—Dredged off Port Jackson, Sydney, April 18, 1874; in 2 to 10 fathoms.

A fragment of about eighteen segments of the anterior region of a large *Sabella*, measuring 32 mm. in length (the branchiæ forming 18 mm. of this) and 8 mm. in diameter.

The body shows a slight median furrow dorsally, while ventrally the usual deep median groove comes forward to the second last scute behind the anterior region, curves outward to the right lateral region and up to the dorsum.

The cephalic collar commences on each side of the deep dorsal groove, and extends without a break to the ventral surface, where it forms a triangular lappet on each side of the median fissure. The collar is prominent, and coloured deep brownish at the ventral lappets.

The branchiæ form a very bushy tuft on each side, consisting of several series (in contraction), especially toward the ventral edge of the radioles. Each fan has upwards of sixty radioles, of a mottled purplish-brown colour, the pinnæ being darker than the mottled radioles. Although folded so closely in contraction, the fan in each case in all probability has only a single series of radioles in full expansion. The pinnæ are arranged very closely along the radioles, and gradually diminish toward the tip, ending first in short papillæ and then in mere crenations. The bare process at the tip is comparatively short and not much tapered.

The tentacle is little more than a third the length of the branchiæ, and is a simple tapering dark brown process attached to the dorsal edge of the fan.

The anterior region consists of eight bristle-bearing segments. The elongated dorsal bristles (Pl. XXXa. fig. 4) possess a very slight bend toward the tip, which is furnished with a narrow wing and a moderately attenuate extremity. The inferior group, again, consists of slender bristles with shorter tips (Pl. XXXa. fig. 5), a more decided curvature, and proportionally broader wings. Both sets of bristles are unusually slender. Posteriorly the tips of the two kinds are not much elongated, but as the example possesses only a fragment of this region, little can be said on the subject. The bristles throughout are of a pale golden colour.

The anterior hooks (Pl. XXXa. fig. 6) have the usual shape, the base being moderately elongated, and truncated posteriorly. It seems to be hollow. The crown has numerous minute teeth, about ten or eleven, appearing in profile above the great fang. The striæ of the neck and body are fairly developed, but not very bold. The ventral line shows a gentle convexity with an inflection posteriorly at the process. The hooks of the imperfect posterior region do not diverge to any extent.

The size of this species affords a favourable opportunity for the examination of the minute structure of the body-wall. In the preparations the cuticle has disappeared, but the basement-tissue of the hypoderm is massive, especially laterally and inferiorly. The pigment distinguishes the hypoderm, while the deeper parts show the pale cells and glands. The circular muscular coat has a much greater tendency to stretch downward into the basement-tissue than in *Sabella pavonina*. Somewhat within the outer third of each longitudinal ventral muscle the outer fibres of the circular coat begin to spread themselves over the basement-layer, and on reaching the nerve-area it is found that the whole coat forms a series of fibres imbedded in this tissue, almost to the pigment. These bundles of fibres join each other so as to form a complex meshwork. Consequently the nerve-area has only areolated basement-tissue outside the cords, the large lateral branches of which are readily distinguished in this translucent matrix. The large neural canals are filled with a coagulable yellowish fluid. The longitudinal muscular fibres on each side of the cords and also at the base of the alimentary ligament enclosing the blood-vessel are well seen. The longitudinal dorsal muscles are massive, and the symphysis in the median line is deep and close. The suspensory ligament of the digestive canal arises only from the fibro-muscular bands below the latter.

The *Sabella fusca*, Ehrenberg (Grube), in the British Museum, from Ceylon, seems to approach this form closely, both in the colour, external appearance, and hooks. The tube is a tough chitinous one, with sand and mud externally and the egg-cases of a Mollusk (like those of *Murex*). It probably came from the tidal region. The absence of definite figures of the hooks renders diagnosis difficult. This species may be connected with the *Spirographis australiensis*, Haswell, as described in his recent paper on the Australian Sabellidæ and Serpulidæ.[1]

Laonome, Malmgren.

Laonome haeckelii, n. sp. (Pl. XXXA. figs. 7–9).

Habitat.—Dredged off St. Vincent, Cape Verde Islands.

A fragment of the tail, measuring about 11 mm. in length, with a transverse diameter at the anterior end of 2 mm.

All that can be said of the external characters is that the dorsal surface is rounded and the ventral flattened. The latter surface, moreover, is marked by a broad, dark brownish central band, which occupies the region of the scutes. At the tip of the tail ventrally are two brown pigment-specks.

[1] *Journ. Linn. Soc. New South Wales*, vol. ix. (sep. copy), p. 24. In this paper the draftsman seems to have inverted some of the figures.

The bristle-tufts show one or two slender dorsal forms (Pl. XXXA. fig. 7) with a serrated and just perceptible narrow wing, and a finely tapered tip; also one or two inferior bristles with a spathulate extremity (Pl. XXXA. fig. 8) and a delicately tapered median process which is finely spinous. The spathulate expansion seems to be due to a modification of the wings.

The hooks (Pl. XXXA. fig. 9) differ from those of the preceding and other *Sabellæ* in having no posterior prolongation of the base, in this respect resembling *Laonome kröyeri* and also from Claparède's *Laonome salmacidis*.[1] The crown is remarkably oblique and very long, the serrations above the great fang being minute. The neck is short, and the dorsal outline, after an incurvation, becomes convex opposite the basal enlargement.

Unfortunately the body-wall of this species was so soft that beyond the statement that it seemed to correspond in general structure with *Sabella pavonina* little can be said.

The form differs from *Laonome kröyeri* in the structure of the bristles and hooks, and in the presence of the pigment-specks at the anus. Kinberg[2] describes another species from the Strait of Magellan.

The *Sabella fusco-tænia*, Grube (var. *phæotænia*, Solander ?), from Ceylon, in the British Museum, has uncini (both anterior and posterior) approaching those of the group in shape, that is, each is devoid of the elongated posterior process.

The *Laonome japonica*, Marenzeller,[3] from Southern Japan, differs from the *Laonome kröyeri*, Malmgren,[4] and the present species in the shape of the hooks. They resemble those of the ordinary *Sabellæ*.

Branchiomma, Kölliker.

Branchiomma vesiculosum, Montagu ? (Pl. XXXA. figs. 10–12).

Amphitrite vesiculosum, Montagu, Trans. Linn. Soc. Lond., vol. xi. p. 19, pl. v. fig. 1.

Habitat.—Dredged at Station 75 (off Fayal, Azores), July 2, 1873; lat. 38° 38′ N., long. 28° 28′ W.; depth, 50 to 90 fathoms; surface temperature, 70°·0; sea-bottom, volcanic mud.

The total length is about 50 mm., of which the branchiæ are 13 mm. The extreme diameter of the body anteriorly is about 6 mm.

The body is more flattened than in *Sabella*, gradually tapered from before backward, and the segments are very distinctly marked. The dorsum shows no trace of a longitudinal furrow, but the ventral scutes from the tip of the tail forward to the second

[1] Annél. Chétop., p. 427, Tab. xxv. fig. 4.
[2] *Op. cit.*, 1866, p. 354.
[3] Südjapan. Annel., p. 16, Taf. iii. fig. 1.
[4] Nordiska Hafs-Annulater (*Öfversigt k. Vetensk.-Akad. Förhandl.*, 1865), p. 400, Tab. xxvii. fig. 85.

last segment behind the anterior region, are split by a median groove. The second last scute just mentioned is separated into two nearly equal halves, the left being only a shade larger. The furrow then enters the sulcus between the segments, and, leaving the scutes, passes obliquely forward to the right over the ventral aspect of the first segment of the posterior region to the groove between it and the last thoracic, and continuing upward, forms an oblique and very perceptible furrow on the right half of the last dorsal segment. A very slight groove runs forward to the cephalic region, but as it is broad and shallow its independent existence is not distinct.

The cephalic region presents dorsally, on each side of the median line, a kind of flap, which is connected by a thin membrane with the prominent lateral edge. The collar runs downward without break to the ventral surface, and terminates in a prominent and somewhat thin triangular flap on each side of the median fissure.

The branchiæ number about twenty-four on each side, and the basal web is short. Except the first dorsal, which is tinted brownish, the radioles are pale. The first dorsal is the strongest radiole on each side, and it has, toward the tip, a very large eye, which is entire internally, but externally is split by the axis passing to the bare terminal process beyond it. The latter is both shorter, deeper, and more flattened than in any of the other branchial radioles. The surface of the greatly enlarged eye is minutely dotted, as if furnished with minute corneal facets analogous to those of Crustaceans and Insects, and it has proximally a kind of peduncle or process. The other radioles are more slender, but have a similarly arranged though much smaller eye in each case, and the terminal process is long and tapering. The eyes seem to be absent on each side in the two ventral radioles, which, like the adjacent organs, are somewhat shorter than the others. The precise nature of the arrangement in this respect, however, is open to further investigation, since the majority have been mutilated and their tips in process of reproduction. The pinnæ are brownish, and here and there white, and they do not diminish much at the tip.

The tentacle is comparatively short and pale, the base being broad and frilled and the tip slender. At the ventral edge of each branchial fan is a hood-like membranous fold, which in the contracted state of the parts opens ventrally.

The thoracic or anterior region consists of nine segments. The bristles form two sets, a long dorsal series (Pl. XXXA. fig. 10) with slender tapering tips and very narrow wings. The inferior bristles have shorter extremities and broader wings (Pl. XXXA. fig. 11), and, moreover, they seem to be minutely spinous. Both kinds possess a peculiar stiff appearance. Posteriorly the wings in both sets are better developed, and, as usual, the tips are much elongated.

The anterior hooks (Pl. XXXA. fig. 12) have a prominent though rather small crown, which is minutely denticulated. The dorsal line below the crown is nearly straight, and the basal process is greatly elongated. The anterior projection or prow is moderately

developed, and the basal line is very slightly convex. The body and basal process are closely striated.

The intestinal pellets showed a few sponge-spicules, minute *Globigerinæ* and Radiolarians, with an occasional long hair from a minute Crustacean.

Externally the body-wall shows cuticle and hypoderm with pigment. The latter forms a prominent cushion with a central fissure over the median ventral region. Sections of what appear to be coils of blood-vessels also occur in this region. The circular muscular coat is somewhat stronger dorsally than ventrally, where in the middle line it spreads out a little below the nerve-cords. The latter are ovoid, and have a large neural canal, with a limpid coagulable fluid. The ventral blood-vessel lies between them superiorly. The longitudinal dorsal muscles toward the end of the anterior third of the body are more than twice the bulk of the ventral. They form a long symphysis in the middle line, and the suspensory ligament of the alimentary canal springs only from the inferior end of the junction. They are most massive at the bulbous external border. These muscles are traversed by various vertical fibres, which join the line of fibres bounding the inner surface of each muscle. The ventral muscles are sausage-shaped, and in section diminished at each end. They are also intersected by vertical fibres. A slender band connects the under surface of the digestive canal with the blood-vessel and central area between the nerves.

This species is widely distributed, since it occurs both on the British coasts and the Atlantic shores of Southern Europe, as well as the Mediterranean.

No tube was present, but Montagu and Claparède found it either of mud or of small stones. The site of the tube in this genus is occasionally remarkable. Thus Claparède[1] found that of *Branchiomma vigilans* placed amongst the felted hairs of *Aphrodita aculeata* at Naples, the posterior end of the tube being fixed to the head of the unwilling host, and the anterior opening either at the anus or laterally between the feet. A very similar species was found by Semper in the Philippines, and termed by Grube *Sabella acrophthalmos*.[2]

Dasychone, Sars.

Dasychone bairdi,[3] n. sp. (Pl. XXXA. figs. 13–15; Pl. XXXVIIIA. figs. 5, 6; Pl. XXXIXA. figs. 2, 9).

Habitat.—From the shore at Bermuda, June 1873.

The length of an average example is about 55 mm., of which the branchiæ form 18 mm. The diameter in front is 4 mm.

The body of this form presents a somewhat flattened aspect, more rounded, however,

[1] Annèl. Chètop., Supplement, p. 137. [2] Annel. Fauna d. Philippinen, p. 258.

[3] Named in remembrance of Dr. Baird, who did valuable work amongst the Annelidan and other departments in the British Museum.

dorsally than ventrally. A slight furrow occurs on the dorsum anteriorly, extending from the posterior (right) border of the last thoracic segment forward to the deep branchial fissure. Ventrally a median furrow passes from the anus forward to the second somite behind the thoracic region, in which it slightly bends to the right, crosses the segment in front obliquely to the lateral furrow, and turns upward to the dorsum as before mentioned. In one example the ventral median line passes anteriorly to the left, so that variation occasionally occurs in this respect. The general colour of the body is madder-brown, with a dark speck at each end of the uncinigerous rows.

By the approximation of the anterior bristle-bundles, the prominent lamellæ of the cephalic collar are drawn nearer each other than usual in *Sabella*. The collar, which is moderately developed, passes downward without break to the triangular lappets on each side of the ventral median line. The lappets are separated by an interval, and reflected toward the ventral surface.

The branchiæ form a graceful fan—on each side—of from twenty-one to twenty-four radioles. The basal region, united by the cuticular expansion, is short. The long radioles are more flexible than usual, so that they form a lax brush anteriorly. Each has externally, at intervals, a pair of ligulate hypodermic processes (Pl. XXXIXA. fig. 2), a shorter pair often alternating with a longer pair. They are somewhat better developed toward the distal region (Pl. XXXIXA. fig. 9). Between each pair are two deep brown oculi (indicated on both of the previous figures), each of which shows externally a transparent coat, with a series of facets pertaining to the glassy cone-like bodies beneath, the bases of the latter resting on a mass of pigment. Toward the tip of the radiole the oculi diminish in size, but have the same structure. The radioles appear to have a bare filiform tip, but as none of the examples showed this part in a satisfactory condition, further examination is necessary.

The basal region of the branchiæ is symmetrically and beautifully striped and mottled with madder-brown, and as a ligule comes off between each radiole the effect is increased. The general colour of the radioles and other parts in the fans is pinkish-brown, the deepest tints occurring on the pinnæ. The flexibility of the radioles is apparently due to the diminution or alteration of the barred cartilaginous axis.

The anterior region consists of the ordinary eight segments, one, however, showing nine; the peculiarity in the latter case being, that instead of a dorsal bristle-tuft and ventral uncinigerous row, there is, besides the usual bristle-tuft, a ventral one, less perfectly formed on the left. The uncinigerous row on the right is very small. The dorsal bristles in the typical forms consist of rather slender forms, with elongated tapering tips and a narrow wing on each side (Pl. XXXA. fig. 13). The inferior series (Pl. XXXA. fig. 14) have broader wings and a shorter extremity. Posteriorly both sets have proportionally broader wings, and the tip is very slightly, if at all, more produced than in front.

The anterior uncinigerous rows fill up the space between the base of the setigerous

processes and the ventral scutes. The hooks (Pl. XXXA. fig. 15) present a strongly curved neck, while the crown is but slightly developed, only two or three teeth being visible in profile, as a rule, above the great fang. The dorsal line is inflected, and the basal region has only a rudimentary posterior process. The anterior projection or prow, on the other hand, is largely developed. The teeth on the crown are better developed on the posterior hooks, and the striæ on the body are more distinct.

The intestine had only a little granular mud with a few sponge-spicules and fragments of a thin shelly lamina that had been perforated by a minute boring form. In one specimen the contents of the intestine were coloured dull orange.

In transverse section of the anterior third of the body-wall the great extension of the longitudinal dorsal muscles is apparent. The longitudinal ventral are also somewhat wider proportionally than in *Sabella*. The hypoderm is comparatively thin and deeply coloured with pigment. The basement-tissue attains great development on the ventral surface, not abruptly, but by a gentle curve. A median fissure bounded by pigment also exists. Considerable differences in appearance occur in this region according to the line of section. Where the instrument passes through the ganglia, the circular muscular coat makes a narrow decussation in the middle line over the summit of the fissure, and a broad area of pigment extends from the latter on each side (Pl. XXXVIIIA. fig. 5); whereas when the section divides the interganglionic region, a much wider decussation is found, and the pigment at the fissure is limited (Pl. XXXVIIIA. fig. 6). Minute blood-vessels are present in the thick ventral hypoderm. The ventral blood-vessel is elevated in the alimentary band above the nerve-area. The perivisceral chamber is filled with minute ova.

Dasychone picta, n. sp. (Pl. XXXA. figs. 16–18; Pl. XXXIXA. fig. 3).

Habitat.—Dredged at Station 233A (off Kobé, Japan), May 19, 1875; lat. 34° 38′ N., long. 135° 1′ E.; depth, 50 fathoms; surface temperature, 62°·6; sea-bottom, sand.

This form, which is incomplete, and could hardly be removed from its tube, to which it is glued by its secretion, measures 33 mm. in length inclusive of the branchiæ (8 mm.). The diameter anteriorly is about 1·5 mm.

So closely do the secretion and mud adhere to the body that serious ruptures ensue in most cases when an attempt is made to remove them. The number of the anterior segments and other points are therefore undetermined. The precise shape of the cephalic collar could not be ascertained. The body is pale, tapers from before backward, and has a minute reddish spot at each bristle-bundle.

The branchiæ appear to be about eight on each side, and are beautifully streaked with reddish-brown and orange, the blotches in each case invading the adjoining pinnæ.

which are less numerous and attenuate than usual. The external processes of the radioles are exceptionally small, indeed, at first sight they are apt to be overlooked. They have the form of small elevations which occur at somewhat regular intervals and resemble abruptly truncated ridges (Pl. XXXIXA. fig. 3). The pinnæ diminish gradually toward the tip, so that there is a considerable portion with short processes. They form mere crenations at the margin of the extremity, which is hardly prolonged beyond them.

The longer anterior bristles (Pl. XXXA. fig. 16) have wings only slightly broader than those of the last species. The shorter forms, again (Pl. XXXA. fig. 17), present broader wings, and have the shaft somewhat narrower below the latter than it is inferiorly. The posterior bristles have the tips in both series more slender and elongate.

The anterior hooks (Pl. XXXA. fig. 18) have in profile about three teeth above the great fang, the crown being slightly developed. The anterior process or prow is well formed, and the basal prolongation posteriorly is of moderate length. The ventral line is bent upward at the commencement of the prolongation. The posterior hooks have a longer neck and a shorter basal process.

The intestinal pellets consisted of fine sandy mud containing many Diatoms, minute ova, and other structures.

The tube is firmly fixed to the cuticle, and is translucent and granular. Here and there a Diatom or sponge-spicule is attached to the surface.

Though somewhat near the *Dasychone cingulata*, Grube, this species differs from both this and the *Dasychone serratibranchis*, Grube,[1] in the absence of ocular spots, and in the nature of the dorsal appendages on the radioles.

Dasychone orientalis, n. sp. (Pl. LII. fig. 5; Pl. XXXA. figs. 19–21; Pl. XXXIXA. fig. 4).

Habitat.—Dredged off Hong Kong, in 10 fathoms.

A species about 50 mm. in length, the branchiæ forming 13 mm. of this amount. The diameter is 2·5 mm. anteriorly. Some appear to have been dried.

The body does not seem to possess any feature of special interest, and indeed the tenacity with which the tube adheres to it renders a minute description very difficult, since its removal ruptures the body-wall and tears off bristles and hooks. The median ventral line seems to follow the usual course, and turns to the right behind the anterior region. A dot of brownish pigment exists between the setigerous process and the hook-row in the posterior division.

The cephalic region presents a slight fold dorsally on each side of the median line, the collar commencing as a prominent lamella with a very thin edge, which, in its passage to

[1] Annelidenfauna d. Philippinen, p. 262, Taf. xiv. fig. 7.

the ventral surface, is marked by a hiatus. On each side of the median line ventrally it terminates in a long triangular flap, which is mottled with purplish-brown internally. In every instance the tube and its secretion are fixed to the latter, and cannot be removed without rupture.

The branchiæ, which as a rule are the only parts that escape adhesion to the tube, are about twenty-six on each side, two or three at the ventral edge of the fan being short and small. The radioles, which are by no means stiff, seem to have their external surface grooved. Toward the base the fan presents both dorsally and ventrally a series of tolerably uniform purplish-brown bands, from the regularity with which the pigment-specks on the radioles are arranged. Distally the pigment is less uniform, though rows are occasionally seen. Each radiole, for instance the first dorsal, shows about twenty-three pigment-specks, from base to apex, the brownish pigment deeply tinting the pinnæ at each spot, so that during expansion the appearance in life must have been beautiful. The axis of the radiole, marked by transverse bars, becomes cellular towards the tip. Externally the radioles are furnished at somewhat regular intervals with pairs of appendages, as in the previous species, only the elevations and the superior or terminal processes are more distinctly developed (Pl. XXXIXA. fig. 4). The pinnæ, which become shorter toward the extremity, rather abruptly diminish to four or five short papillæ, and cease, the terminal filament being in the preparations slightly enlarged in the middle and constricted below the somewhat bulbous tip.

The number of segments in the anterior region appears to be eight, but, as formerly mentioned, a clear view of these is not attainable. The long dorsal bristles (Pl. XXXA. fig. 19) have slender tips with narrow wings; while the inferior shorter series possess wider wings and a less attenuate termination (Pl. XXXA. fig. 20). Besides these, as usual, a series that hardly projects beyond the setigerous lobe occurs. The tips of these are shorter and the wings considerably broader. The extremities of the posterior bristles are extremely elongate.

The anterior hooks (Pl. XXXA. fig. 21) show a moderately developed crown, with about six or seven small teeth in profile above the great fang. The neck is rather elongated, and the basal prolongation posteriorly comparatively short. The anterior projection or prow is gently curved, the distance between the base of the great fang and the basal line being great. The posterior hooks present more distinctly developed teeth above the great fang.

The structures recognisable amongst the greyish mud forming the faecal pellets are numerous Diatoms, and a few Radiolarians and minute ova.

The tube is constructed of greyish mud, and microscopically contrasts strongly with the foregoing, in regard to the large amount of quartzose sand-grains, fragments of sponge-spicules, and minute arenaceous Foraminifera. It is friable, and easily detached from the branchial region, but the secretion glues it to the rest of the animal. Toward the

posterior end the tube is more chitinous. Various external growths such as Hydrozoa and Polyzoa are attached to its external surface.

Unfortunately no example sufficiently preserved for minute examination exists, and though, after failure to remove the animal satisfactorily from its tube, a section of both was made, little reliable information with regard to the adherent animal was obtained. The inner or chitinous lining of the tube is perfectly hyaline and translucent.

The *Dasychone luctuosa*, Ehrenberg,[1] from the Red Sea, seems to be a nearly allied species.

Dasychone japonica, n. sp. (Pl. XXXA. figs. 22–24; Pl. XXXIXA. fig. 5).

Habitat.—Dredged at Station 233A (off Kobé, Japan), May 19, 1875; lat. 34° 38′ N., long. 135° 1′ E.; depth, 50 fathoms; surface temperature, 62°·6; sea-bottom, sand.

The specimen is of considerable size, measuring 70 mm. in length, the branchiæ making up 18 or 20 mm. of this total. The diameter anteriorly is fully 5 mm.

The animal is somewhat softened, but the body appears to have the ordinary form, viz., a round dorsal surface and a flattened ventral surface. Dorsally only the cephalic median groove is present. Ventrally the median furrow courses forward to the second segment behind the anterior region, splitting it obliquely to the right of the middle line, cutting off an angle from the segment in front of it, and apparently terminating in the right lateral furrow between it and the last thoracic segment. The body is pale, with the exception of a number of purplish-brown specks over both ventral and dorsal surfaces of the thoracic (anterior) region, and a small brownish pigment-speck between the setigerous processes and uncinigerous rows.

The cephalic collar begins as a prominent lobe at each side dorsally, passes downward without a break, though gradually diminishing in depth to the ventral median lobes, which are rather thick and bluntly triangular, the apex being external. Both sides of the collar are speckled with dots of brownish-purple.

The branchiæ seem to number thirty-eight or forty in each fan, but all the radioles had been injured except one. They are beautifully striped with alternate circular bands (in mass) of purplish and reddish brown. The radioles are somewhat firm rods, provided externally with ligulate processes in pairs (Pl. XXXIXA. fig. 5). Some of these are longer than others, but no definite regularity in this respect is visible; and in the same way some are coloured and others pale, as they happen to come in the line of pigment or otherwise. The shorter processes are often fusiform. The first of the series occurs as a single filament between each fork above the web. The axis of the radiole shows a largely developed cartilage, which is composed of a closely arranged series of transversely

[1] Grube (Anneliden des rothen Meeres), *Monatsber. d. k. preuss. Akad. d. Wiss. Berlin*, 1869, p. 37 (sep. Abd.).

elongated cells, with a median junction. Moreover, the axis of each pinna comes off therefrom as a bulbous cellular process. The radiole tapers toward the tip, the pinnæ diminish to mere papillæ, and finally a bare terminal filament only remains. The pinnæ are purplish and pale alternately, the reddish-brown bars on the radioles apparently not affecting them to any appreciable degree. Each reddish-brown bar on the radioles has a pair of lateral (ocular) pigment-spots.

The anterior region of the body consists of eight segments. The dorsal bristles are unusually slender and attenuate at the tip, and the wings are very narrow, though distinctly serrated (Pl. XXXA. fig. 22). The inferior group present a less elongated extremity and a broader wing (Pl. XXXA. fig. 23), and they also appear in many cases to have a more decided curve toward the tip. The posterior bristles preserve the same relative proportions, the dorsal being extremely elongate, while the serrations on the margin of the wings of the inferior bristles are very distinct.

The hooks in the anterior uncinigerous rows are characteristic (Pl. XXXA. fig. 24), presenting a boldly curved neck, the outline from the crown to the base of the posterior process forming one continuous convexity. A single tooth only exists above the great fang. The anterior projection or prow is largely developed. The posterior basal process, again, is short, and inclines downward at the tip.

The fine greyish mud in the alimentary canal presented numerous Diatoms, a few sponge-spicules and Radiolarians. The transparent cylinders with the attenuate points were also common.

This and the foregoing forms differ considerably in the structure of the body-wall from *Dasychone dalyelli*. In the present instance the hypoderm in section is fairly developed, and the basement-tissue beneath is in many parts supplied with blood-vessels. These do not appear to pass into the hypoderm proper. The circular coat is very strong dorsally, spreads out about the inner third of the longitudinal ventral muscles, and extends over the whole of the central area beneath the hypoderm. In this region numerous blood-vessels are present. The longitudinal dorsal muscles are more massive and less extended than usual, and a marked hiatus exists in the median line. On the other hand the ventral are considerably flattened. Posteriorly a median furrow appears in the hypodermic process on the ventral surface; and the longitudinal dorsal muscles are much extended. The perivisceral chamber contains many small ova.

Dasychone wyvillei, n. sp. (Pl. XXXIA. figs. 1–3).

Habitat.—Found between tide-marks at St. Thomas, West Indies, March 23, 1873.

The body of this large and massive species measures 74 mm. without the branchiæ (which are absent). The transverse diameter of the body just behind the thoracic region is 10 mm.

The dorsal surface of the body is smoothly rounded, from the tip of the tail forward to the cephalic groove. The thoracic region is marked by a pale band, which is the continuation of the ventral groove. The ventral surface is flattened, and a furrow, commencing posteriorly at the tip, splits the scutes in the middle line; but when it reaches the fourth behind the thoracic region it deviates a little to the right and finally passes obliquely through the last one to the groove between the posterior thoracic foot and the first abdominal, and becomes continuous with the dorsal band formerly mentioned. A distinct papilla occurs on each side of the ventral groove in the anterior scutes of the abdominal region, and these processes also exist in the same position (though the groove has disappeared) on the three adjacent thoracic scutes.

The cephalic region has dorsally a deep furrow, surmounted along each edge by a continuation of the cephalic collar, which forms an accessory flap on each side. It is rendered the more conspicuous by a deep brownish belt a little below the edge. The collar, which is folded outward in the example, continues without break to the ventral median fissure, and terminates in a triangular reflexed flap on each side. The inner edge of the flap has a dark brown band of pigment. The general colour of the body is pale madder-brown, deeper in front, while the branchiæ have a deep chocolate-brown base. In the posterior region a dark spot occurs at the base of each setigerous process, and another at the end of the uncinigerous row.

The anus is directed dorsally rather than ventrally.

The anterior or thoracic region consists of the typical eight segments. The bristles of the upper series somewhat resemble those of *Dasychone japonica*, the wings, however, being slightly more pronounced (Pl. XXXIA. fig. 1). The inferior series present the same differences from the foregoing in regard to the tips, which are proportionately shorter (Pl. XXXIA. fig. 2). The usual elongation occurs in the tips of the posterior bristles. Both series are thus allied to those of *Dasychone japonica*.

The anterior hooks (Pl. XXXIA. fig. 3) possess an elongated neck, with a comparatively small inferior prow. The finely serrated edge above the great fang is of moderate length, and the crown of the hook is somewhat truncate with a central depression. The posterior or dorsal line is nearly straight, or only slightly convex. The posterior basal appendage is fairly developed, and elevated above the ventral line which curves upward to join it.

Few Diatoms occur in the contents of the intestine, but minute Radiolarians, with sponge-spicules, minute ova, bristles of one of the Lumbrinereidæ, a parasitic Crustacean of a few segments, and fragments of Pteropod shells are present.

Dasychone nigro-maculata, (Baird) (Pl. LIII. fig. 5; Pl. XXXIA. figs. 4–6; Pl. XXXIXA. fig. 6).

Sabella nigro-maculata, Baird, Journ. Linn. Soc. Lond., viii. p. 159, pl. v. figs. 5, 6.

Habitat.—Found between tide-marks, St. Thomas, West Indies, March 23, 1873.

The body measures about 37 mm. in length, and the branchiæ extend to another 11 mm. The diameter at the widest part is 6 mm.

The body is somewhat rounded dorsally and flattened ventrally, and rather abruptly tapered toward the tail, on which the anus is distinctly dorsal in position. The ventral median line passes forward to the front of the abdominal region, cutting the second scute obliquely to the right of the middle line, and the right corner off the first scute, in its passage to the groove between the thoracic and abdominal regions to turn upward on the dorsal surface. It forms a pale groove on the latter surface, at first directed obliquely forward and inward, and is lost anteriorly in the median cephalic groove. A faint dorsal line exists all along the body, an indication probably of the raphe, but it forms no distinct groove.

The cephalic collar has its dorsal edges wide apart, and no accessory dorsal lamellæ exist as in the previous species. It continues without break to the ventral furrow, and terminates in a large auricular process on each side of the fissure.

The body and collar are blotched and speckled with dark brownish or purplish-brown spots. A well-marked brown spot occurs between the setigerous process and the uncinigerous row, both in the thoracic and abdominal regions; and there is also a less distinct speck at the inner termination of the hook-rows in the latter region. The darker pigment in the thoracic region, however, may obscure the speck.

The somewhat short branchiæ number on each side from forty-two to forty-three. In the preparations their colour is brownish, mottled here and there with pale patches. Externally a series of rather short appendages occur in pairs (Pl. XXXIXA. fig. 6), the first appearing in the sulcus at the base between the radioles, which are numerous and slender. The pinnæ become shorter toward the tip, but none of the branchiæ are so perfect as to show whether any bare filament does or does not exist at the extremity. All that can be said is that such is probable. The radioles present a segmented appearance, a depression with an encircling line occurring at regular intervals, a little beyond each pair of external processes. The segments are comparatively short. A little beyond the distal edge of the segment-junction are a pair of lateral (ocular) pigment-spots. The axial tissue of the radioles is fairly developed, so that they are firm.

The thoracic region consists of eight segments. The dorsal bristles (Pl. XXXIA. fig. 4) are somewhat similar to those of the previous species, but the tips are decidedly more spinulose both along the edges of the wings and on the dorsum (or opposite side). The

intermediate bristles (Pl. XXXIA. fig. 5) have somewhat narrower wings than in *Dasychone wyvillei;* and the short series below these show only slightly broader wings and a somewhat shorter tip. On the whole the bristles approach those of *Dasychone japonica.*

The hooks (Pl. XXXIA. fig. 6) resemble very much those of *Dasychone japonica,* having only a single tooth in profile above the great fang. The anterior curvature of the neck, however, differs, greater prominence being given to the prow, and the posterior basal process is more pointed.

The greyish mud in the intestine showed a few Diatoms, Foraminifera, fragments of sponge-spicules, and Algæ.

The hypoderm is moderately developed and deeply coloured all over. The basement-tissue beneath is also visible throughout, and forms the usual ventral part, which, however, is limited in extent and has a median fissure. The fibres of the circular muscular coat pass across the nerve-area without spreading downward into the region beneath. The longitudinal ventral muscles are somewhat narrow and wedge-shaped, massive internally and pointed externally. The nerve-cords are situated about the middle of the space between these muscles, and present rather small neural canals superiorly. The longitudinal dorsal are broad transversely, and they are separated in the middle line only by a notch inferiorly.

No tube is present in the Challenger examples; but in Dr. Baird's preparation (no locality) two tubes occur. The anterior region of the tube is composed of greyish mud externally, while posteriorly the chitinous lining is exposed. Another series of specimens is also in the British Museum from St. Vincent, West Indies.

Dasychone violacea, (Schmarda) (Pl. LIII. fig. 3; Pl. XXXIA. figs. 7, 8; Pl. XXXIXA. fig. 7).

Sabella violacea, Schmarda, Neue wirbell. Thiere, I. ii. p. 34, Taf. xxii. fig. 187.

Habitat.—Procured at Sea-Point, near Cape Town, between tide-marks, December 1873.

The total length of a large example is 64 mm., of which the branchiæ constitute nearly 20 mm. This, of course, gives only an approximative idea of the living animal. Schmarda states that his specimens measured 80 mm., and that the branchiæ were 20 mm.

The body in the preparations is comparatively pale, but a tinge here and there indicates that in life it probably was purplish, the colour given by Schmarda. The dorsum is convex, a shallow median groove, however, occurring toward the tail. Only a trace of the continuation of the ventral median line is present in the thoracic region in the form of a groove, a little above the first bristle-tuft. The ventral surface, again, is

somewhat flattened, and excavated by a median depression. The usual fissure proceeds forward in the central line to the thoracic division, and it shows only a slight bend to the right in the two anterior abdominal scutes. In the preparations the ventral scutes are (transversely) very wide and (antero-posteriorly) very short. A dark pigment-speck exists at the commencement of each uncinigerous row.

The cephalic collar originates as a V-shaped structure dorsally, the inner leg of the V being less prominent and running as a slight ridge along the sides of the median groove forward to the base of the branchiæ. The collar proper commences in front of the first bristle-tuft, and, somewhat within it, proceeds rather more than a third of the distance downward, where a break or fissure occurs, and ends in two large broad lappets on each side of the median line. In the preparation the collar still remains of a rich purple.

The branchiæ are arranged in two spiral tufts of the same fine purple colour, mottled here and there with pale streaks. Their number is very large, and in this respect they present a decided divergence from Schmarda's form, which is described as having but twenty-one on each side. It is not easy to estimate the exact number, but they must be considerably more than a hundred. The radioles are comparatively slender and flexible, and are furnished at intervals with pairs of small external appendages (Pl. XXXIXA. fig. 7), which do not occur at the base in the intervals between the radioles, as in the former species; moreover, they become longer and somewhat spathulate or auricular (as indicated in the figure) toward the tip, which has a short, bare filiform termination. The pinnæ are very numerous but not proportionally long, and gradually diminish distally, without, however, showing the truncated nodular or papilliform stages, as in some allied forms.

The tentacles are short, stout, acutely pointed processes placed on each side at the anterior end of the dorsal cephalic furrow, and their tips only extend a little beyond the separation of the radioles from the basal web. They are slightly grooved on the ventral surface.

The thoracic region possesses the ordinary eight segments, and the approximation of the bristles of the opposite sides anteriorly gives a marked curvature to the outline of the dorsum. The bristles are comparatively uniform in structure, the differences between the dorsal and ventral types being less pronounced than usual, some of the dorsal being longer and narrower, and some of the inferior shorter and broader than the intermediate type figured (Pl. XXXIA. fig. 7). The tips of the posterior bristles do not show much elongation, while the wings are somewhat broader.

The anterior hooks (Pl. XXXIA. fig. 8) have remarkably fine serrations above the great fang, appearing, indeed, under a low power to be almost smooth. The prow or anterior projection is moderately developed. The posterior basal process is comparatively short, truncated and bent downward at the tip. The dorsal outline curves

gently from the crown outward and downward to the base. The posterior basal process is considerably less in the posterior hooks, which also show a proportionally longer neck and shorter body.

The food of this form is very rich in sponge-spicules, with a few Diatoms, minute *Globigerinæ*, bristles of Annelids, and other debris.

The short tube is composed of a tough chitinous secretion surrounded by mud anteriorly and a few fragments of shells and other structures posteriorly. It is more brittle anteriorly than posteriorly. Microscopically the greyish mud exhibits coarse sand-particles, numerous sponge-spicules, a few Diatoms and gritty masses of mud and sand, probably arenaceous Foraminifera.

The structure of the body-wall appears to be nearly typical, though the rudimentary condition of the circular muscular coat inferiorly causes a divergence in the region below the nerve-area, which is remarkable for its great extent, the transverse diameter being only a little shorter than that of the ventral muscles.

I have doubtfully referred this species to Schmarda's *Sabella violacea*, though he does not mention the dorsal appendages of the branchiæ, which also are few in his form. It is possible that the want of definition in Schmarda's description may mislead. It would require a re-examination of the type, however, to set the matter at rest.

Dasychone capensis, n. sp. (Pl. LIV. fig. 1; Pl. XXXIA. figs. 9–11; Pl. XXXIXA. fig. 8).

Habitat.—Dredged at Station 142 (off the Cape of Good Hope), December 18, 1873; lat. 35° 4′ S., long. 18° 37′ E.; depth, 150 fathoms; bottom temperature 47°·0, surface temperature 65°·5; sea-bottom, green sand.

The length of the body is about 28 mm., and of the branchiæ about 18 mm. The diameter of the body anteriorly at its widest part is 4·5 mm.

The body is somewhat rounded dorsally, this surface being marked only by the cephalic groove in front, the termination of the furrow from the ventral surface on the right side anteriorly, and by the transverse lines of the segments. Ventrally the median groove passes forward to the sulcus behind the first abdominal segment, and then is directed obliquely to the right (left as viewed from the ventral surface), cutting off a small area of the latter on its way to the lateral groove. The general colour of the body is ferruginous, with a deep brownish speck below the bristle-tufts, at the commencement of the uncinigerous rows, in the thoracic region, and a similar pigment-speck at the end of each hook-row in the same division. Posteriorly the dark pigment-speck is above each bristle-tuft.

The cephalic collar commences at the base of each branchial fan near the middle line, trends outward to the sides of the body, and bends downward to the centre ventrally to terminate in the reflected lappets, a slight marginal notch occurring just before the curve downward.

The branchiæ form two rather elongated fans, barred at short intervals (at the ocular spots) with brown bands. The radioles are slender and the pinnæ long. The latter somewhat diminish in length toward the tip, but the terminal ones are ong enough to envelop the filiform tips of the radioles in the preparations. The basal external appendages of the radioles are rather long and spathulate (Pl. XXXIXA. fig. 8), but become more slender as well as much shorter toward the filamentous tip, at the base of which the last pair occur. These processes somewhat resemble those of Grube's *Sabella* (*Dasychone*) *polyzonos*[1] from the Island of Lussin in the Adriatic. The lateral ocular spots are in the brown pigment-band, a little beyond (distal to) each pair of external appendages. The axis of the radiole presents the usual division by transverse septa into spaces.

The tentacles are of moderate length, bayonet-shaped and grooved. They seem to be longer in immature specimens.

The thoracic or anterior region has eight segments. The bristles in each tuft present well-marked groups. The dorsal (Pl. XXXIA. fig. 9) bear elongated tips and narrow wings; the inferior (Pl. XXXIA. fig. 10) have broader wings and shorter extremities; moreover, the wings are not so distinctly separated from the axial portion. Both possess very evident crenations at the margin. The posterior bristles again show very finely tapered extremities attached to the region with broad wings.

The anterior hooks (Pl. XXXIA. fig. 11) present about six or seven very distinct teeth above the great fang. A somewhat wide sinus exists below the latter, for the prow is moderately developed. The posterior basal process is curved slightly downward and truncated. The convexity behind the crown is well-marked, and the dorsal line is continuously arched. In the posterior hooks the neck is more elongate.

The intestinal masses are composed of fine mud containing fragments of sponge-spicules and Radiolarians, Diatoms, Coccoliths, and Coccospheres, fragments of Foraminifera, an anomalous four-rayed body with transverse markings, and another of a circular form with concentric radii.

No tube is present, but as the species was dredged in green sand, the tube may have been brittle or the protection only a hole in the sand.

The structure of the body-wall agrees with that in *Dasychone violacea*, the only noteworthy difference being the presence of a median fissure in the ventral pad.

[1] Beschreibung neuer oder wenig bekannter Annel., *Archiv f. Naturgesch.*, 1863, p. 63 (sep. Abd.), Taf. vi. fig. 5*a*.

Family Serpulidæ.

In comparison with former expeditions that of the Challenger has produced a comparatively large number of species belonging to this family. No less than nineteen different forms, besides fragments of undetermined species, occur. The majority come from depths under 500 fathoms, but five are from the abysses of the ocean. Prof. Ehlers[1] was specially interested in finding Serpulidæ from considerable depths in the collection made by the U.S. steamer "Blake," viz., about 860 fathoms, especially as he had not found such in the materials from the "Porcupine." In the present series, however, we find that *Serpula philippensis* reaches 1050 fathoms, a *Vermilia* 1450 fathoms, *Placostegus challengeriæ* 2375 fathoms, *Placostegus ornatus* 2900 fathoms, and *Placostegus benthalianus* the still greater depth of 3125 fathoms. Examples of the same genus, moreover, occur equally in shallow water as in the abysses of the Pacific.

Schmarda gives eleven representatives of the family, mostly from shallow water or between tide-marks. Several come from coral reefs. Kinberg records five species. Grube mentions three in the Annulata Œrstediana, two in the collection of the "Gazelle," and seven in the Philippine series. An interesting résumé of the genera included under the family is given by Marenzeller as an introduction to the description of the seven species from Southern Japan. His remarks in regard to the structure of the hooks in the various groups are both appropriate and useful.

The food of the members of this family is the same as that of other Annelids.

The absence of *Spirographis* (*Cymospira*), *e.g.*, the well-known *Cymospira gigantea*, Pall., is remarkable.

While Philippi's view with regard to the diagnostic value of the operculum is noteworthy and merits his opinion that it has "the advantage that it may still be frequently observed in dried specimens preserved in Museums," much has to be added to it. For instance, the structure of the body-wall and the minute characters of the bristles and hooks are indispensable in modern work. Even Mörch's more recent Revisio critica Serpulidarum[2] fails in the anatomical characters just mentioned. The remarks by Langerhans in his recent paper on the Serpulidæ of Madeira[3] are noteworthy. He makes three types, the first including the genera *Serpula*, *Eupomatos*, *Pomatoceros*, and *Placostegus*, while near them are *Protula* and *Psygmobranchus*. The second type includes *Filograna*, *Apomatus*, *Filogranula*, *Salmacina*, *Spirorbis*, and *Pileolaria*; while the third group is represented by *Vermilia* and *Omphaloma*.

[1] *Bull. Mus. Comp. Zoöl.*, vol. v. p. 274, 1878–79.

[2] *Naturhistorisk Tidsskrift*, June 1863, p. 347.

[3] *Zeitschr. f. wiss. Zool.*, Bd. xl. pp. 273–275. Prof. Langerhans is a noble example of an invalid who has the courage to do valuable work under physical disadvantages.

Protula, Risso.

Protula capensis, n. sp. (Pl. LIV. fig. 2; Pl. XXXIA. figs. 12, 13).

Habitat.—Dredged at Station 142 (off the Cape of Good Hope), December 18, 1873; lat 35° 4′ S., long. 18° 37′ E.; depth, 150 fathoms; bottom temperature 47°·0, surface temperature 65°·5; sea-bottom, green sand.

In the contracted spirit-specimen the length is 50 mm., and the diameter between the bases of the bristles in the thoracic region 6·5 mm. The transverse diameter of the posterior region at its widest part is 7 mm.

The body is, as usual, divided into three very distinct regions, viz., the branchial, the thoracic, and the abdominal.

The branchiæ form two great fan-shaped processes, which, when viewed internally, seem to spring from each side of a broad, flattened membranous lamella with a neatly rounded terminal margin, the superior or dorsal edge sending a free ridge over the bases of the branchiæ. It is the rounded ventral margin of this lamella that appears to turn in first when the fan is rolled up. The radioles are attached to the edge of the lamella to the number of about fifty-seven, and they are bound together by a web for some distance above the base. Externally the basal region of the fan (the apex being at the inferior or attached point) presents a smooth surface. Each radiole consists of a somewhat flexible axis with a large cavity, and, as usual, there does not appear to be any special development of a cartilaginous kind, at least to any extent, so as to render the radioles stiff. It accordingly shrivels up very much in Farrant's solution, the transverse striation being apparently due to the structure of the hypoderm. Fixed in the tissues of the axis in one specimen, and quite visible under a lens, are many rounded granular bodies like ova, and some present a distinct egg-capsule. Whether these be parasitic ova or otherwise is yet an open question. They certainly do not move in the central canal, but are fixed. The tip of the radiole tapers to a filiform termination, a considerable part being free. The pinnæ are closely set, commencing as short processes at the base, and again diminishing below the filiform tip. They seem to be proportionally stiffer than the main stem. An opaque line runs along the bases of the pinnæ, and probably indicates the position of the vessels.

The margin of the truncated anterior region is bounded laterally by a continuation of the great lamella, which has a break at each side, but forms a continuous collar across the ventral aspect, and in the preparations this is reflected. There is thus a great contrast between the ventral border in this group and that in the Sabellidæ. In the cavity of the branchial fan were fæcal pellets, mud, and Foraminifera.

The only representative of the tentacle is a double fold of the basibranchial lamella at the dorsal edge.

The body is wide in the thoracic, somewhat fusiform in the abdominal region, that is, slightly narrowed at the commencement, dilating as we proceed backward, and again diminishing more decidedly toward the tail.

The thoracic region consists of seven segments, draped on each side by the great membranous lamella, which projects far beyond the bristles, and ventrally forms a broad apron across the anterior part of the abdominal division. The dorsal surface of the region is smooth. The ventral presents somewhat festooned borders from the interruption of the folded membranous lamella opposite each foot. Just in front of the plait or apron which overlaps the anterior border of the abdominal region is a tessellated area of limited extent (in those best developed about half the breadth of a segment).

The bristles are pale yellowish, the dorsal having extremely attenuate tips, with just a trace of wings, the inferior having peculiarly flattened and rather short extremities (Pl. XXXIa. fig. 12), the winged region being less differentiated than usual in such forms. A double line below the broad falciform tip, and a slight indication of wings near the ventral edge of the latter, however, are present. The shaft of the bristle narrows below the tip, and slightly enlarges toward the insertion inferiorly. They are slender. The posterior bristles, again, are likewise elongated structures with tapering tips, which have no distinct traces of wings. Each bristle-tuft springs from a prominent foot-papilla, which is flattened antero-posteriorly, and presents a dorsal and a ventral ridge.

The abdominal region is dorsally also somewhat rounded or convex transversely, and deeply furrowed by a broad flat groove along the ventral median line.

The anterior uncinigerous pads commence at the third bristle-tuft (a small papilla which occurs below the second tuft being devoid of hooks). The latter (Pl. XXXIa. fig. 13) differ from those of the British form in the greater elevation of the crown, and in the short and well-marked process behind the great fang. The curvature of the body behind the latter is also quite different from that in the British species, and whereas the sinus below the great fang is long in the latter, it is short in the present form.

The fine greenish-grey mud in the intestinal pellets showed sponge-spicules, Diatoms, and minute ova.

No tube is present.

The structure of the body-wall in the anterior third somewhat diverges from that in the British *Protula protensa*, in which the dorsal muscles are very massive. The nerve-cords, however, occupy a similar position, viz., at the inner edge of the longitudinal ventral muscles. The wide interneural area is occupied by the basement-tissue of the region, fibres from the sheath of the alimentary tube, and a thin stratum of longitudinal fibres. Externally are a thin layer of circular fibres and the hypoderm. The ventral blood-vessel lies within the circular coat. Posteriorly the longitudinal dorsal muscles approach each other more closely in the middle line, and each forms a more extended lamina. The nerves are as widely separated as in front. The great development of the

ventral hypodermic flaps is noteworthy. Each extends over a larger base than the longitudinal ventral muscle of its side.

The hooks of *Protula* (*Psygmobranchus*) *multicostatus* and *Protula cæcus* of Claparède, and those of *Protula arctica*, Hansen,[1] so widely diverge from the foregoing that a different genus will probably require to be constituted. On the other hand, they approach those of *Protula* (*Psygmobranchus*) *protensa*, as figured by Claparède,[2] though they are nevertheless distinct.

Protula lusitanica, n. sp. (Pl. XXXIA. fig. 16).

Habitat.—Dredged at Station II. (off the Portuguese coast, near Setubal), January 13, 1873; lat. 38° 10′ N., long. 9° 14′ W.; depth, 470 fathoms; surface temperature, 57°·0; sea-bottom, green mud.

A fragment of the anterior region of a minute specimen, measuring about 5 mm. in total length, and scarcely 1 mm. in diameter.

The fragment of the body is normal. The cephalic collar forms a continuous reflected fold ventrally, and, turning over at each side dorsally, passes backward above the bristle-tufts to the posterior end of the thoracic region. The branchiæ are all injured, but they seem to have the usual structure, with a long, bare, filiform tip. Seven bristle-bearing processes occur on each side in the thoracic region. The bristles present the usual tapering tips with well-marked wings. The anterior hooks (Pl. XXXIA. fig. 16) have a simple curve (convexity) from the crown to the inflection, and a comparatively short edge behind the great fang inferiorly. They differ from those of the *Protula* from Valentia, and *Protula capensis*, and are somewhat triangular in outline.

The specimen was unfortunately lost, having been carried out of the dissecting-trough by a hair.

Protula arafurensis, n. sp. (Pl. XXXIA. figs. 17, 18).

Habitat.—Dredged in the Arafura Sea.

A fragmentary example, reaching 32 mm. in length and fully 2 mm. in diameter behind the thoracic region.

The branchiæ are absent, but the body has the usual form. The cephalic collar shows a broad fold ventrally, and then forms a membranous expansion over the thoracic setigerous processes. Two prominent papillæ occur on the dorsum just behind the snout, for the attachment of the branchiæ. Six setigerous processes occur on each side. The bristles (Pl. XXXIA. fig. 17) are elongate, slightly curved toward the extremity, which is finely tapered and furnished with well-marked wings. The tips on the whole are

[1] *Op. cit.*, p. 43, Tab. vii. fig. 30.

[2] Annél. Chétop., p. 432, pl. xxx. fig. 7.

considerably shorter than in the British *Protula* from Valentia, on the south-west of Ireland. The posterior bristles are simple slender processes, with a slight curvature at the narrow shortly tapered tip, and traces of wings in the form of lateral lines. Such, therefore, differ very much from the posterior bristles of the British species, with their broad flattened tips.

The anterior hooks (Pl. XXXIa. fig. 18) present the elevated crown of the genus, and it is somewhat more elongated than usual. Anteriorly is a long and minutely serrated region above the great fang, which projects considerably beyond the process below it. The outline of the hook is less triangular than in *Protula lusitanica*, indeed, with the exception of the projecting crown, the outline nearly follows that of a parallelogram.

The intestinal mud presented numerous Diatoms, sponge-spicules, minute Radiolarians, and a few Foraminifera.

The cuticular and hypodermic layers at the anterior third of the body-wall are comparatively thin, a condition very marked in the median line ventrally. Each nerve-cord is situated in the angle formed by the oblique muscle from the lower edge of the longitudinal dorsal, having externally the large neural canal and the longitudinal ventral muscle. The chief part of the area of the body in section is occupied by the alimentary canal, and as wide a hiatus exists between the longitudinal dorsal as between the ventral muscles. The former are about three times as bulky as the latter, and from the inner and inferior border an oblique muscular band passes to the inner edge of the nerve-cord, and completes the sheath for the alimentary canal. The latter is further steadied by a median band dorsally and ventrally, the central vessel in the latter region being situated below its attachment. The longitudinal muscles seem to have a somewhat pennate arrangement of their fibres, as usual in the group. In the posterior region of the body the hypoderm increases in thickness laterally and ventrally, the lamellæ of the latter being of great delicacy. The longitudinal dorsal muscles form flattened plates, still considerably larger than the ventral. The latter have also extended very much, but have the same relations to the nerve-trunks and neural canals.[1] The perivisceral chamber in this region is distended with small ova which press the intestine to the middle line.

Protula americana, n. sp. (Pl. LIV. fig. 3; Pl. XXXIa. figs. 19, 20).

Habitat.—Dredged at Station 49 (south of Halifax, Nova Scotia), May 20, 1873; lat. 43° 3′ N., long. 63° 39′ W.; depth, 85 fathoms; bottom temperature 35°·0, surface temperature 40°·5; sea-bottom, gravel and stones.

The specimen (removed from the tube) measures 28 mm. in length, and has a transverse diameter anteriorly of 2 mm.

[1] Claparède gives good sections of the body-wall in *Protula intestinum* in his Recherches sur la struct. des Annel. Sédent., pl. viii. figs. 1–7.

The branchiæ are united by a web at the base, and form two masses of slightly twisted radioles, which have a smooth tapering filament at the tip. The dorsal edge of the cephalic collar forms a large and somewhat fan-shaped flap, and is separated by a deep notch at the lateral region from the ventral division. The latter is less prominent in the middle than at the sides, but the edge is entire with the exception of a few frills. It seems to present the usual relations in the thoracic region.

The bristles of the anterior division (Pl. XXXIA. fig. 19) are of a pale yellow colour, and have very delicately tapered tips, only distinguished from the shaft by a slight curvature. The wings are very narrow. The developing forms have broader tips. The posterior bristles show the usual linear form, and their tapered extremities are slightly curved.

The anterior hooks (Pl. XXXIA. fig. 20) present an elevated crown, which is slightly bulbous toward the summit, a deep dorsal concavity and numerous small teeth above the great fang. The latter does not project so far beyond the prow as in *Protula capensis* or *Protula lusitanica*. The general outline of the hook is less rhomboidal than in the former species. The crown is more elevated, and the great fang less produced at the tip than in the *Protula* from St. Andrews.

The posterior hooks diverge very little from the foregoing. The dull greyish sandy mud in the alimentary canal contained numerous Diatoms and a few Radiolarians.

The species inhabits a comparatively smooth, coiled tube, marked here and there by wrinkles and soldered to other tubes or its own coils. This is unusual in the *Protula* of British waters, though it is not a feature of much moment.

In transverse section the body-wall at the termination of the anterior third presents a considerable thickness of hypoderm, especially ventrally, the deeper region characteristic of the latter commencing, externally, on each side about the middle of the ventral longitudinal muscle. The circular muscular coat is thin but distinct. The longitudinal dorsal are proportionally less bulky than in such as *Protula arafurensis*, and they are as massive superiorly as inferiorly. More than a third of each muscle leaves the circular coat inferiorly and rests on the oblique, so that a part (thin edge) overhangs the outer end of the longitudinal ventral. The inner edge superiorly is pointed, and separated by a wide hiatus from its fellow. The longitudinal ventral muscles are not quite half the bulk of the former, and are elongate-ovoid in shape. The nerve-cord lies against the inner border, and intervenes between them and the neural canal, though a thin stratum of longitudinal fibres, as in certain other species, passes externally to both nerve and canal, and appears almost to join that of the opposite side. The neural canal contains the usual coagulable fluid. Within the circular muscular coat dorsally is a firm though thin band of fibres which courses on each side along the inner margin of the longitudinal dorsal muscle, joins the oblique fibres from the outer surface of the latter at its inferior border, and slants to the ventral edge on each side of the middle line, the fibres running into

each other. This forms the basis for the thick layer of glandular tissue lining the alimentary canal, and consequently the disposition of the parts is noteworthy.

This species approaches Schmarda's *Protula appendiculata*,[1] from Jamaica, in regard to the tube, but differs from it in other respects.

Apomatus, Philippi.

Apomatus elisabethæ,[2] n. sp. (Pl. LIV. fig. 4; Pl. XXXIA. figs. 21, 22).

Habitat.—Trawled at Station 167 (a little to the east of the sound between the north and south islands of New Zealand), June 24, 1874; lat. 39° 32′ S., long. 171° 48′ E.; depth, 150 fathoms; surface temperature, 58°·5; sea-bottom, blue mud.

The total length of this species is about 18 mm., of which the branchiæ measure about 8. The diameter of the body in the anterior thoracic region is 1·6 mm.

This species differs from the British representative of the genus (*Apomatus ampulliferus*, Phil.) in the great proportional length of the branchiæ, and in the presence of a broad membranous wing on the radioles on each side of the pinnæ. The portion of the fan united by a common web inferiorly is very short, viz., only a small margin above the edge of attachment, and a fragment at the base of each radiole. The radioles throughout the rest of their extent are quite free. The membranous wings are not much developed at the base, but widen on each side about the middle of the process, and continue as broad lamellæ to the tip, the smooth filament terminating the organ being thus abruptly distinguished. The flattened region of the radiole seems to be formed by the hypoderm and cuticle. The pinnæ are richly ciliated, and the terminal filament also shows a few fine cilia toward the tip, but whether these be vibratile or only palpocils could not be determined. One of the branchiæ (probably the second dorsal, but there is difficulty in distinguishing, since the branchiæ were separated and fragmentary), while resembling the rest in other respects, has at the tip a globular process which is much less in proportion than in the British form. Three or four of the radioles at the side of the fan opposite the globule are short and rudimentary, the wings especially being deficient.

The cephalic collar forms a prominent ridge all round the front. It is entire ventrally, but has a notch in the mid-lateral region at each side. Turning backward from the great dorsal frill at each lateral angle, it passes under the bristles, and forms a broad apron behind the thoracic boundary.

There are seven setigerous processes in the thoracic region. The first as usual occupies a dorsal position considerably in front of the others, the rest being lateral, and directed upward and backward. The bristles (Pl. XXXIA. fig. 21) are comparatively

[1] Neue wirbell. Thiere, I. ii. p. 33, Taf. xxii. fig. 185.

[2] Named after my best aid in marine zoology. The title of the remarkable *Euphione elisabetha* has the same origin.

slender, with much elongated tapering tips bordered by a somewhat narrow wing. The shorter series in each is composed of proportionally stouter bristles with a slightly broader wing. Towards the posterior end each segment possesses about three very long, slender bristles, with slightly curved, simple, tapering tips.

The anterior hooks (Pl. XXXIA. fig. 22) much resemble those of *Protula*. The small teeth above the great fang are, however, less numerous, apparently being proportionally larger. The dorsal curve, moreover, is not evenly outlined. The sinus below the great fang is somewhat wide. The posterior hooks do not materially differ.

In the digestive canal was a little greyish mud showing Diatoms, Coccoliths and Coccospheres, minute *Globigerinæ* and other Foraminifera, with a few Radiolarians.

The specimen occurred in a smooth white tube, not unlike that of *Hydroides*, on *Pomatocerus strigiceps*.

The *Apomatus globifer*, Théel,[1] from Nova Zembla, differs in the absence of the lateral expansions on the radioles, and in the smoothness of the tube. The hooks in the northern form are more finely toothed. Langerhans[2] states that this form is identical with Marion and Bobretzky's *Apomatus ampulliferus*. Marenzeller's Japanese *Apomatus enosimæ* is peculiar in having the minute teeth prolonged on the base of the great fang. This is exceptional, and may be due to the engraver. The teeth in the typical *Apomatus ampulliferus* of Philippi, as figured by Marion and Bobretzky,[3] and that of their own new species (*Apomatus similis*), nearly correspond with those of the Challenger form.

Serpula, Linnæus.

Serpula sombreriana, n. sp. (Pl. XXXIA. figs. 14, 15).

Habitat.—Dredged off Sombrero and St. Thomas, in 470 and 390 fathoms.

A small specimen, measuring about 12 mm. in length and 1 mm. in diameter immediately behind the thoracic region. It had apparently been dried, and can only be imperfectly described.

A bare filament seems to be present at the tip of the radioles of the branchiæ, which present the ordinary characters.

A very interesting feature is the peculiar arrangement of the cephalic collar, which forms three conspicuous lobes. Two of these are dorsal, forming on each side of the middle line a large triangular lamella, which reaches about as far backward as the penultimate bristle-tuft of the thorax. A deep fissure on each side separates the foregoing region from the great triangular ventral flap, the apex of which extends to a

[1] *K. Svensk. Vetensk. Akad. Handl.*, Bd. xvi., No. 3, p. 66, pl. iv. figs. 63–65, 1879.
[2] *Zeitschr. f. wiss. Zool.*, Bd. xl. p. 277, 1884.
[3] *Ann. d. Sci. Nat.*, sér. 6, t. ii. pl. xii. fig. 24*e*, 1875.

distance equal to the length of the thorax beyond it. Five pairs of setigerous processes are distinct on the thorax, but the presence of a rudimentary sixth is possible. The bristles consist of a longer and shorter series. The former (Pl. XXXIa. fig. 14) have a straight shaft with a peculiarly tapered tip, the axis of which is bent at a slight angle to the former, thus differing from the kind of bristle observed in *Protula* (which has a much longer tip), and more allied to the structure seen in *Serpula vermicularis*. The wing is well marked though narrow, and is slightly serrated at the margin. The shorter series show very slender shafts, less than a third the length of the former, and delicately tapered extremities. The posterior bristles are extremely slender, with a slightly curved tip, an indication of the winged region.

The anterior hooks (Pl. XXXIa. fig. 15) have a long straight edge, minutely serrated, and terminating inferiorly in a larger process—the great fang. The crown passes backward to join a nearly straight dorsal line, and there is no sinus behind the great fang.

The trace of mud in the alimentary canal showed Diatoms and sponge-spicules.

In all probability this is a *Serpula*. It is devoid of the thoracic membrane, and the remarkable collar may be found in others of the genus. No operculum is present.

Serpula narconensis, Baird (Pl. LIV. fig. 5; Pl. LV. fig. 1; Pl. XXXIa. fig. 23).

Serpula narconensis, Baird, Proc. Linn. Soc. Lond., vol. viii. p. 21 (1864).
Serpula (?), M'Intosh, Ann. and Mag. Nat. Hist., ser. 4, vol. xvii. p. 322 (1876).
Serpula patagonica, Grube, Monatsber. d. k. preuss. Akad. d. Wiss. Berlin, Aug. 1877, p. 550.

Habitat.—Dredged abundantly at various Stations, *e.g.*, at Station 144a (off Marion Island), December 26, 1873; lat. 46° 48′ S., long. 37° 49′ E.; depth, 69 fathoms; surface temperature, 41°·0; sea-bottom, volcanic sand. Station 149c (in Balfour Bay), January 19, 1874; lat. 49° 32′ S., long. 70° 0′ E.; depth, 60 fathoms; sea-bottom, volcanic mud. Station 151 (off Heard Island), February 7, 1874; lat. 52° 59′ S., long. 73° 33′ E.; depth, 75 fathoms; surface temperature, 36°·2; sea-bottom, volcanic mud.

The total length is about 43 mm. from the tip of the operculum to the tail, and the diameter just behind the thoracic region is fully 5 mm.

The branchiæ are densely covered with pinnæ, and have been decorated with bars of white. The radioles possess a smooth filiform tip. A female Crustacean parasite like *Ergasilus* was seen on the branchiæ of one example, but could not be subsequently found for description.

The operculum is much firmer than in *Serpula vermicularis*, and the peduncle is separated by an evident articulation from the bell-shaped distal portion, the latter commencing at once with a diameter fully twice that of the former. The radii of the

disk are fewer, and the conical apices are longer and more acute. Thus, for instance, a British example of *Serpula vermicularis* has forty-six complete radii, one or two having double apices; whereas in the form from Kerguelen there are thirty-five radii, one having the apex double.

The anterior bristles, which occupy seven pairs of setigerous processes, are stronger and larger than in *Serpula vermicularis*, with the tip very finely tapered (Pl. XXXIA. fig. 23). The wing is comparatively narrow. The usual shorter and more slender series occur in each tuft.

The hook shown in the previous publication (Transit of Venus Exped., Phil. Trans., vol. 168, pl. xv. fig. 16) is less broadly triangular than usual.

The food of those from Station 151 (off Heard Island) consisted of Diatom ooze, a considerable number of sponge-spicules and Radiolarians, however, being present amongst the Diatoms. Those from Marion Island (Station 144A) had likewise Diatom ooze containing different forms of Diatoms, a few minute Foraminifera, Radiolarians, and sponge-spicules.

The tubes of those from Marion Island present many prominent rings from the widely expanded apertures, showing that growth had apparently taken place to some extent by fits and starts, or at least that periods of quiescence had occurred. This condition has been descanted on by Claparède[1] in the case of Delle Chiaje's *Serpula crater* from the Bay of Naples. The tube is much longer and more slender than in *Serpula vermicularis*, and instead of the recumbent and attached condition of the latter it forms free masses, to which are fixed various organisms, *e.g.*, Polyzoa. When the masses are uninjured it is found that the tubes are slender inferiorly, and that they dilate gradually toward the anterior end. In the interstices of one mass of tubes is a tunnel of *Neottis antarctica;* while Compound Ascidians, Polyzoa, and other structures show by their condition that the tubes are comparatively free. Many of the tubes are soldered together longitudinally. None are straight; all are more or less sinuous.

In transverse section, toward the termination of the anterior third, the hypoderm and its basement-tissue are thicker ventrally than in *Serpula vermicularis*. The longitudinal dorsal muscles are also more extended, and are connate in the median line. The longitudinal ventral muscles are proportionally smaller, but the nerves and neural canals have the same relative position, that is, the latter lie near the muscles. In both a line of longitudinal muscular fibres passes between the nerve-cords. The fasciculi of the great longitudinal muscles are pennate in transverse section. The changes which ensue in the appearances of the body-wall of the Serpulidæ in full maturity are well shown in a transverse section of *Serpula uncinata*, Grube, given by Prof. Schenk[2] in his paper on the development of the eggs in the group. The present species appears to be the *Serpula narconensis* of Dr. Baird, one example of which,

[1] Annél. Chétop. (Supplement), p. 160.

[2] *Sitzungsb. d. k. k. Akad. d. Wiss. Wien*, Bd. lxx., 1874.

without the tube, was procured by the Antarctic Expedition of Sir J. Clark Ross at Narçon Island, and which is still present in the collection of the British Museum. The specimen, which was described from the collection made at Kerguelen by the Rev. A. E. Eaton during the Transit of Venus Expedition,[1] had no operculum, and thus it was difficult to say much about it. An examination of the specimen in the British Museum, however, removed all doubt as to the relationship. Grube's species (*Serpula patagonica*), which was obtained both at Kerguelen and in the Strait of Magellan, seems to be identical. The *Serpula vasifera*, Haswell,[2] from Port Jackson is a near ally, having, however, fewer crenations in the operculum, and a different hook. The *Serpula jukesii*, Baird,[3] is a distinct species.

Serpula narconensis, Baird, var. *magellanica* nov. (Pl. LV. fig. 2; Pl. XXXIA. figs. 24, 25).

Habitat.—Trawled at Station 308 (in the Strait of Magellan), January 5, 1876; lat. 50° 8′ S., long. 74° 41′ W.; depth, 175 fathoms; surface temperature, 51°·7; sea-bottom, blue mud.

A much smaller variety than the former, the total length being 23 mm., and the diameter anteriorly a little more than 1 mm.

In the general form of the body it agrees with the foregoing, the thoracic bristle-tufts and other parts having the typical arrangement. The branchiæ are similar though apparently longer, and also possess bare filiform tapering tips. The operculum resembles that of *Serpula narconensis*, but it is easily distinguished, being thinner, and being furnished with a longer vase-shaped portion and a longer pedicle. There are thirty-four divisions of the rim of the operculum, being only one less than in *Serpula narconensis*, but the tips of the segments in the latter are much more pointed, from the inflection of the boundary-line on each side on its way to the apex. In this form the lines are nearly straight, as in *Serpula vermicularis*. The apex of each, however, is less truncated than in the latter.

The bristles of the thoracic region (Pl. XXXIA. fig. 24) have fine tapering tips, with a somewhat broader wing than in the typical *Serpula narconensis*, though in the latter case position often exaggerates the distinction; but on the whole the extremities are somewhat shorter than in the latter form. The posterior bristles present similar features.

The anterior hooks (Pl. XXXIA. fig. 25) diverge from those of the ordinary *Serpula narconensis*, being shorter and provided with a proportionally longer dorsal line. Six teeth (instead of seven or eight) only occur above the great fang. The figure of the hook in each form approaches that of an equilateral triangle. Well-marked striæ cross the

[1] *Ann. and Mag. Nat. Hist.*, 1876, ser. 4, vol. xvii. p. 322.
[2] *Proc. Linn. Soc. New South Wales*, 1884, vol. ix. (sep. copy) p. 20.
[3] *Journ. Linn. Soc. Lond.*, 1864, vol. viii. p. 20, pl. ii. fig. 6.

body of the hook in a direction parallel to the dorsal line. The sinus beneath the great fang is somewhat larger than in the type formerly described. The posterior uncini show a much more elevated crown, a more distinct inflection of the dorsal line, and about eight teeth above the great fang.

The food of this species consists of mud, containing numerous Diatoms, several fine varieties of *Challengeria*, small bivalves, minute ova, and other structures.

The tubes have less of the free habit noticeable in the former type of *Serpula narconensis*, being attached to shells, sea-weeds, and sponges; several tubes, moreover, being frequently connected together by their sides. The trumpet-like expansion of the terminal portion of each tube is well developed, and the rings thus formed, by apparently alternate stationary intervals and periods of active growth, occur toward the anterior ends, but they are fewer in number than in the much larger form from Kerguelen. Some of the tubes are tinted of a pinkish hue, as in *Serpula vermicularis*, and there is a greater tendency to form coils on shells and other organisms than in the previous type, the anterior portion of the tube projecting upward in a more or less erect condition, as in *Serpula vermicularis*.

The body-wall of this form is slow in assuming the typical arrangement, since section at a corresponding point in the anterior third shows a more delicate arrangement of the hypoderm, the thicker ventral belt diminishing toward the middle line. The massive dorsal longitudinal muscles are separated by a wide median interval, and they pass toward the wall of the alimentary canal inferiorly. The longitudinal ventral muscles are lateral in position, the large nerve-cord being below them. Moreover, no neural canal is visible. The very long ventral hiatus has from the nerve-cord inward the following structures, viz., a band of fibres from the inferior edge of the longitudinal dorsal muscle, a series of fibres connected with the sheath of the alimentary canal, and which pass from the median hiatus of the dorsum to form a loop over the ventral median line, lastly a thin plate of longitudinal fibres within the circular coat on each side of the central region.

The relation of Kinberg's *Zophyrus loveni*, from the same locality, to this species is uncertain.

Serpula philippensis, n. sp. (Pl. LIV. fig. 7; Pl. XXIXA. fig. 28).

Habitat.—Trawled at Station 205 (off the Philippine Islands), November 13, 1874; lat. 16° 42′ N., long. 119° 22′ E.; depth, 1050 fathoms; bottom temperature 37°·0, surface temperature 82°·0; sea-bottom, blue mud.

This small form is fragmentary, its tube being attached to what appears to be a piece of wood. The tube (Pl. LIV. fig. 7) is coiled in various ways, the smaller end being marked by two longitudinal furrows, while the larger anterior end exhibits these

less distinctly. Two ridges occur on the dorsum between the furrows, and perhaps are more characteristic than the latter.

The branchiæ are so injured that it can only be mentioned that the radioles are peculiarly broad (from within outward), but no wing is present, and there is no opercular development in the preparation.

The anterior bristles have the usual tapering tips and wings, the latter being marked by very large serrations. The posterior bristles present the ordinary linear form, with a slight curve at the attenuated extremity.

The anterior (or thoracic) hooks (Pl. XXIXA. fig. 28) have a characteristic shape, the body being rather long, as indicated by the great length of the dorsal line and the prolongation below the great fang. Five or six teeth occur above the latter. An inflection exists in the dorsal line. The anterior inferior process or prow is gently cut away below the great fang. The posterior uncini show more numerous teeth, and the projection of the crown further backward alters the curvature of the dorsal line.

The body has the usual pair of papillæ at the posterior end.

Serpula vermicularis, Linné.

Habitat.—Dredged in the "Knight Errant," Station 3, August 3 and 4, 1880; lat. 59° 12′ N., long. 5° 57′ W.; depth, 53 fathoms, off the island of North Rona.

Pomatocerus, Philippi.

? *Pomatocerus strigiceps*, Mörch (Pl. LV. figs. 3, 4; Pl. XXXIA. figs. 26–28).

Pomatocerus strigiceps, Mörch, Naturhistorisk Tidsskrift, Kjøbenhavn, June 1863, p. 412.

Habitat.—Trawled at Station 167 (in a line nearly opposite the strait between the north and south islands of New Zealand), June 20, 1874; lat. 39° 32′ S., long. 171° 48′ E.; depth, 150 fathoms; surface temperature, 58°·5; sea-bottom, blue mud. It was formerly procured off North Australia and New Zealand.

The length of the specimen (removed from its tube) is 48 mm., with a diameter of fully 3 mm. immediately behind the branchiæ. The latter measure 9 mm. in length, and the operculum and its pedicle 11 mm.

The branchiæ form a dense slightly wavy tuft, with the radioles united inferiorly by a common web for a third of the total length, and the basal region forms a smooth ring. Each radiole is furnished with closely set and rather long pinnæ, and the tip, which is only slightly tapered, has a short, smooth, filiform process. The extremity appears to be more obtuse than in *Pomatocerus triqueter*, since the pinnæ extend freely outward as far as the filiform tip. The development of the pigment, moreover, gives

rise to a beautiful tessellated aspect, apparently from its occurrence in rhomboidal nucleated cells, in regular rows and distinctly separated from each other.

The operculum forms a circular, somewhat fragile and slightly concave, shelly disk coloured very prettily by radiate bands of a pinkish or salmon hue, broader at the circumference and narrower at the centre. The rim of the operculum is double, the outline between the two rings being concave. In one small example no less than four tiers of the opercular rim are present (Pl. LV. fig. 3), the upper being smaller and less concave than usual. The operculum is supported on a stout peduncle with a broad wing at each side, terminating at the base of the region proper in a free conical process of the ordinary appearance. In one instance peculiar minute concretions occur on the tessellated epithelial surface of the wings, the rounded nodules being crystalline or spinose under the microscope. No rudimentary peduncle or operculum exists on the right side.

The anterior region is composed of seven segments, each carrying a pair of setigerous processes. The first is considerably in front of the others, and dorsal instead of lateral in position. It is also very much smaller, and the bristles, which are less perfectly developed, have a different direction. The other six pairs are deep yellow, have straight shafts, with the tips distinctly bent and furnished with well-marked wings (Pl. XXXIa. fig. 26). The posterior bristles, again, quite differ, presenting broad extremities obliquely tapering to a long filiform process at one side (Pl. XXXIa. fig. 27), and having the anterior or distal edge of the tip covered with spines, which also pass along the shoulder or broad process. The shafts of these bristles are nearly cylindrical.

The cephalic collar, which is continuous with the lamella passing backward beneath the bristle-rows on each side, presents a complex arrangement dorsally. A large frilled and fan-shaped process occurs at each dorsal angle, the outer edge being separated by a deep notch from the succeeding part. A peculiar region, having the aspect of a partially folded fan, comes next, and is generally placed beneath the former in the ordinary condition in the preparations, while it also is separated by a deep notch from the rest. The collar is continued ventrally and crosses to the opposite side, the margin being cut into broad scallops, but showing no median fissure. The thoracic prolongations of the respective sides join together ventrally behind the last uncinigerous process of the region.

Each thoracic uncinigerous row has a pigment-speck at the ventral end, just in front of its termination. The hooks (Pl. XXXIa. fig. 28) are somewhat triangular in outline, and have about fifteen teeth above the inferior one (great fang) which is peculiarly bent upward. With the exception of the first (or upper) two the teeth are large superiorly, and gradually diminish toward the inferior end. The last process (corresponding to the great fang) follows a similar direction at the base, but is curved upward at the tip. The dorsal line is comparatively long, and shows only a trace of an inflection a little below the middle. The basal line is somewhat convex and cuts off the anterior angle, so as to remove the usual projection. The body of the hook is boldly

striated nearly at right angles to the teeth. The posterior hooks are smaller than the foregoing, form a triangle with a more acute apex at the great fang (curved inferior tooth), and the number of teeth is smaller, viz., about thirteen, exclusive of the inferior process.

In the alimentary canal of this form Coccoliths and Coccospheres are very abundant; Diatoms, arenaceous and calcareous Foraminifera are also common; while an occasional Entomostracan, *Gregarina*, and peculiar translucent pointed bodies like shuttles, truncated at one end, are comprised amongst the other organisms.

The tubes, which are bound together, are massive, triangular in cross-section, and the dorsal keel is often roughly serrated. The aperture is little, if at all, dilated, is smoothly rounded internally, and externally marked by the terminations of the three ridges. The tube is streaked with a pinkish or salmon colour, which also tints the lips of the aperture. In one example two regularly arranged longitudinal rows of pores occur a short distance below the dorsal keel.

Various commensalistic bodies, from Foraminifera to Mollusks, occur on the anterior end of the tubes, which thus appear to have been tolerably isolated. The species, however, may occur in larger masses.

A form allied in the shape of the operculum is *Pomatostegus bowerbankii*, Baird, from Australia, but the hooks quite differ. The *Pomatostegus cariniferus*, Baird, is likewise dissimilar. Grube's *Pomatocerus multicornis*,[1] from the Red Sea, differs in the structure of the basal region of the operculum. Both this and Ehrenberg's *Pomatocerus sanguinea*, however, are allied forms.

Placostegus, Philippi.

Placostegus ornatus, Sowerby (Pl. LV. figs. 5, 6; Pl. XXXA. figs. 25, 26).

Habitat.—Trawled at Station 244 (in the deeps of the Pacific), June 28, 1875; lat. 35° 22′ N., long. 169° 53′ E.; depth, 2900 fathoms; bottom temperature 35°·3, surface temperature 70°·5; sea-bottom, red clay.

Also at Station 253 (further westward in the same area), July 14, 1875; lat. 38° 9′ N., long. 156° 25′ W.; depth, 3125 fathoms; bottom temperature, 35°·1; sea-bottom, red clay. This specimen was attached to a nodule forwarded by Mr. Murray.

And at Station 285 (in the abyss of the Pacific, midway between Sydney and Valparaiso). October 14, 1875; lat. 32° 36′ S., long. 137° 43′ W.; depth, 2375 fathoms; bottom temperature, 35°·0; sea-bottom, red clay.

The length of the largest example (which is considerably shorter than the tube) is 19 mm., with a diameter anteriorly of 1 mm. The diameter of the tube at the anterior aperture is barely 2 mm., and it tapers gradually to a slender point posteriorly.

[1] Anneliden des rothen Meeres, *op. cit.*, p. 39.

The branchiæ in the best specimen measure about 6 mm. in length, and, as removed from the tube, present nearly straight radioles. The latter are free, with the exception of the narrow basal region, and are supplied with richly ciliated pinnæ, which, instead of gradually diminishing toward the tip, retain considerable length, so that in profile the tip is almost clavate. Each radiole tapers toward the extremity, and ends in a slender, smooth, free filament.

The operculum (Pl. LV. fig. 6) extends a little beyond the tips of the branchiæ, and consists of a somewhat small, circular, whitish plate strengthened by a calcareous deposit, and having a yellowish line at its base. It is supported on a hollow dilatation, shaped like a wine-glass, the narrow part being attached to the long slender pedicle, which has an enlargement at the junction, with several crenations beneath. The entire organ is longer than in *Placostegus tricuspidatus*, Sowerby. No trace of an abortive operculum occurs on the left side.

None of the specimens is sufficiently perfect to show the exact condition of the cephalic collar, or the number of the tufts of thoracic bristles. The latter are pale yellowish, the dorsal forms having rather elongated tips (Pl. XXXa. fig. 25). The posterior bristles, again, possess elongated shafts and short extremities with broad wings (Pl. XXXa. fig. 26), and the curvature at the tip is pronounced.

The anterior hooks (Pl. XXXa. fig. 27) present a shape similar to those of *Serpula philippensis*, and have six well-marked teeth above the great fang, which projects considerably beyond the others. The dorsal outline shows a long concavity. The prow below the great tooth is slightly developed, though it is much more so than in *Serpula philippensis*. The body of the hook is crossed by numerous striæ, which form the usual angle with the teeth. The posterior uncini possess a more elevated crown, and the prow beneath the great fang is less developed.

The dense tube (Pl. LV. fig. 5) is fixed to manganese nodules or other similar concretions. The attached surface is flattened, the rest is irregularly rounded, a deep longitudinal groove running on each side a little above the flattened basal region (in transverse section), so as to cut the transverse ridges into isolated bars. From this groove the ridges are continued dorsally, and in front often with a direction somewhat forward and inward. In the same region of the tube the ridge has a slight mucro or thickening, projecting forward in the middle line, the anterior margin of the ridge on each side thus presenting a slight concavity. Behind the foregoing the transverse ridges are nearly straight, while posteriorly the mucro of the dorsal ridge points backward, and the lateral thickening on each side is very decidedly marked. Internally the surface of the tube is perfectly smooth and white.

In transverse section of the body-wall posteriorly, a firm but thin cuticle, and a very thin hypoderm are visible. It is difficult to distinguish the circular muscular coat as a separate layer. The longitudinal dorsal muscles form long plates, which extend upward

from the infero-lateral region to the median line. These muscles are composed of a number of very fine, closely arranged plates which give a regularly striated appearance to the part in section. The muscles are most bulky inferiorly. The ventral region presents two prominent curved ridges, and an intermediate hollow. In the former the longitudinal ventral muscles are situated, and they are of considerable size, notably exceeding those in the previous genus. A long hiatus exists between them. The body-cavity was so distended with reproductive elements that the nerve-cords could not be seen distinctly, but they appeared to be in their usual position at the inner border of the muscles.

Placostegus benthalianus, n. sp. (Pl. LV. fig. 7; Pl. XXXa. fig. 28).

Habitat.—Dredged on the nodule forwarded by Mr. Murray at Station 253 (Mid Pacific), July 14, 1875; lat. 38° 9′ N., long. 156° 25′ W.; depth, 3125 fathoms; bottom temperature 35°·1, surface temperature 67°·7; sea-bottom, red clay.

The specimen is quite fragmentary, so that a minute description is unattainable. It is smaller than the foregoing, the widest portion being only a little more than 1 mm.

The branchiæ seem to approach those of *Placostegus ornatus* in forming a somewhat truncated outline in mass, and in possessing a smooth free filament at the tip of each radiole. The operculum constitutes a hollow platter with a yellowish-brown rim, carried upon the summit of a hollow process, shaped like a wine-glass. The peduncle is dilated distally, and forms a kind of shoulder at its junction with the former region.

The bristles of the anterior region are similar to those of the preceding species, presenting a long and very attenuate tip, with a bend where it joins the shaft, and distinct wings.

The anterior hooks (Pl. XXXa. fig. 28) differ from those of the former species in outline. Only four teeth occur above the great fang. The prow beneath the latter is much better developed than in *Placostegus ornatus*, and the concavity in the dorsal outline is deeper.

The tube of this form is pentagonal, the three upper ridges especially being prominent, and armed with a series of blunt teeth, which posteriorly (at the smaller end of the tube) disappear, leaving only slightly rugose ridges. One surface, as in the preceding, has been attached to the nodule.

Placostegus mörchii, n. sp. (Pl. LV. fig. 8; Pl. XXXa. figs. 29, 30).

Habitat.—Trawled at Station 285 (in the Pacific, mid-way between Sydney and Valparaiso), October 14, 1875; lat. 32° 36′ S., long. 137° 43′ W.; depth, 2375 fathoms; bottom temperature 35°·0, surface temperature 65°·0; sea-bottom, red clay.

This specimen diverges in certain respects from either of the preceding.

The branchiæ appear to be similar, but the pinnæ are decidedly longer, if the preparation is to be relied on. The tips of the radioles have smooth filiform processes. The operculum somewhat resembles that of *Placostegus benthalianus*, though the surface is less scooped in the example. Moreover, it is borne on one of the branchial radioles, which is specially strengthened for its support, while clothed with pinnæ up to the terminal dilatation below the opercular region proper. Another branchial radiole is somewhat thickened, and bears at the tip a clavate process, representing a rudimentary opercular development.

The cephalic collar is incomplete, but a large rounded flap occurs on each dorso-lateral region.

Most of the thoracic bristles are absent. In one tuft (apparently the second) two groups are present, viz., a series of slender tapering bristles, probably the dorsal, and another group of stouter bristles (Pl. XXXA. fig. 29), with peculiar tips, a distinct shoulder occurring below a concavity or "bite." The former probably indicates the distal end of the shaft. When viewed antero-posteriorly an enlargement is also very evident at the upper end of the shaft, showing that it is thickened all round.

The anterior hooks (Pl. XXXA. fig. 30) approach the foregoing forms in outline, but differ in possessing five teeth above the great fang, in having a sharper angle at the inflection of the dorsal line, and in possessing a proportionally wider base than either *Placostegus ornatus* or *Placostegus benthalianus*.

The tube is not pentagonal, but from the presence of a deep groove on each side has rather a quadrangular appearance in transverse section, though the dorsal line is rounded (convex). It is somewhat wrinkled, but is devoid of the bold transverse ridges of *Placostegus ornatus* or the longitudinal toothed eminence of *Placostegus benthalianus*.

Placostegus assimilis, n. sp. (Pl. LV. fig. 9; Pl. XXIXA. figs. 29, 30).

Habitat.—Dredged at Station 33 (off the Bermudas), April 4, 1873; lat. 32° 21′ N., long. 64° 35′ W.; depth, 435 fathoms; surface temperature, 68°·0; sea-bottom, coral mud.

The specimen is about the same size as the British *Placostegus tridentatus*, J. C. Fabricius.

The branchiæ appear to agree in form with those of *Placostegus tridentatus*, but they are longer. They also have a smooth filiform tip. The opercular region, however, differs very considerably in shape. The dull yellowish operculum proper is less concave, though of similar thickness and having the same brownish rim. Instead of the simple clavate

opercular process, a more rapid slope occurs all round, so that the upper part forms a short cone with the base at the operculum, and its apex inferiorly abuts on a dilated region, which sometimes shows three prominent folds, while the distal end of the peduncle is specially narrowed immediately beneath. Both divisions are more delicate or membranous than in *Placostegus tridentatus*. A small example presents a variation in the structure of the operculum, for a second small horny plate is mounted on an inverted cone above the usual one (which is flexible), and the three membranous folds inferiorly are absent. A slight enlargement also exists at the distal end of the peduncle.

The collar is prolonged into remarkable membranous processes. Dorsally a long lanceolate appendage occurs on each side of the middle line, a very long process on the left side extends about three-fourths the length of the branchiæ, and the collar on the right is split into several shorter processes. A forked appendage exists ventrally on each side of the middle line. This laciniate condition of the collar is peculiar.

The anterior bristles (Pl. XXIXA. fig. 29) are pale yellow, and resemble those of *Placostegus tridentatus*, the tip being finely tapered, slightly curved backward, and supplied with distinct wings.

The anterior hooks (Pl. XXIXA. fig. 30 [1]) are very numerous, and consist of thin plates with a thickened outer edge, very minutely serrated, and having inferiorly a longer spine, the homologue of the great fang. The fineness of the serrations along the thickened edge is probably in relation with the very dense and smooth tube. The hooks, moreover, seem to possess greater flexibility than usual. The posterior uncine do not materially differ, though the crown appears to be more rounded.

The food of this form consists of fine mud containing a few minute Foraminifera, sponge-spicules, and Coccoliths. Only traces of Diatoms occur.

The tube is glassy, somewhat triangular, with a dorsal and two lateral ridges, each terminating in a spine anteriorly. Moreover, several have, at the elevated anterior part of the tube, one or two prominent spines on the dorsal and lateral ridges. The tube is attached by the flattened lower surface to various submarine bodies, such as tests of Echinoderms, the anterior end, as a rule, being elevated. In well-marked specimens the dorsal ridge forms a spinous crest, with the points directed forward. The lateral ridges possess a similar though less developed armature. In minute examples these spines are more regular and beautiful, and they are quite visible on young specimens about the diameter of a hair. They are attached to the tubes of the older forms. Some of the tubes show peculiar lines, apparently due to a borer or other parasite.

Attached to a piece of a spatangoid test is a fragment of an opaque tube having six ridges superiorly, the three middle spinose.

A special feature in transverse sections of the anterior region is the great extent of the rows of hooks. The longitudinal dorsal muscles meet in the middle

[1] The engraver has not executed his task correctly along the serrated edge.

line, and are of considerable bulk, though not massive. The longitudinal ventral muscles, again, are peculiar in having much hyaline connective tissue mingled with the fibres. The nerve-cords are widely separate in front, but appear to approach more closely posteriorly. The preparations, however, are unsatisfactory from softening, and it is observed that a special disposition must exist since the ventral muscles nearly meet in the middle line. The perivisceral chamber is dilated with the reproductive elements. The fact that the alimentary canal is distended with siliceous sand also makes the sections less distinct.

Placostegus tridentatus, O. Fabricius.

Habitat.—Dredged in the "Knight Errant," Station 5, August 11, 1882; lat. 59° 26′ N., long. 71° 19′ W.; bottom temperature 45°·4, surface temperature 50°·6; depth, 515 fathoms.

Hydroides, Gunner.

Hydroides multispinosa, Marenzeller (Pl. XXIXA. fig. 26, 27; Pl. XXXIXA. fig. 12).

Hydroides multispinosa, Marenzeller, Südjapan. Annel., Denkschr. d. k. Akad. d. Wiss. Wien, Bd. xlix. p. 216, Taf. iv. fig. 2, 1884.

Habitat.—Dredged off Kobé, Japan, in 8 to 50 fathoms.

The specimen is fragmentary, and somewhat less than an average example of *Hydroides norvegica.*

The branchiæ resemble those of the latter species, but the tapering filiform process at the tip is much shorter. The operculum is also constructed on the same plan, with an inferior cup cut into numerous segments. The upper spinose circle, again, has fewer processes, eleven only being present (Marenzeller gives twelve), while in *Hydroides norvegica* there are nineteen. They are, however, more slender (Pl. XXXIXA. fig. 12).

The body is too much injured to afford minute characters, but the cephalic collar probably resembles that of the ordinary species. The bristles (Pl. XXIXA. fig. 26) have decidedly less attenuate and elongate tips than in *Hydroides norvegica*, and the wing is more distinctly serrate at the edge.

The anterior hooks (Pl. XXIXA. fig. 27), again, instead of having only five teeth above the great fang, as in *Hydroides norvegica*, show seven, so that the appearance of the edge is complex, the teeth being smaller and more numerous. The body of the hook is crossed by striæ, nearly at right angles to the direction of the teeth. The prow is obtusely truncate; and the dorsal line forms a larger angle than 90° with the ventral. The posterior hooks, as far as could be ascertained, have five or six teeth, which, moreover, appear proportionally larger than those in front.

The fine greyish mud in the intestine showed many fine Diatoms, and a few fragments of sponge-spicules amongst the scanty sand-grains. Numerous ova were also present.

The fragmentary tube agrees in curvature and appearance with that of *Hydroides norvegica*.

This form appears to coincide with Marenzeller's recently published species from the tidal region at Ino Sima, Southern Japan. He figures the posterior inferior angle of the hook as less than a right angle, but in the present example it is rather more than a right angle.

Hydroides norvegica, Gunner.

Habitat.—Dredged in the "Knight Errant," Station 3, August 3 and 4, 1880; lat. 59° 12′ N., long. 5° 57′ W., depth, 53 fathoms, off the island of North Rona.

Vermilia, Lamarck.

Vermilia (?) sp. (Pl. XXXA. figs. 31, 32)

Habitat.—Trawled at Station 302 (in the Pacific, off the west coast of Patagonia), December 28, 1875; lat. 42° 43′ S., long. 82° 11′ W.; depth, 1450 fathoms; bottom temperature 35°·6, surface temperature 55°·0; sea-bottom, Globigerina ooze.

The specimen consisted of a fragment of a small tube with the contained Annelid attached to a nodule of pumice. A tube apparently belonging to Prof. Allman's *Stephanoscyphus* occurred on the same nodule.

The Annelid is fragmentary. The radioles of the branchiæ are very definitely segmented, and they have a rather long filiform tip. The slender peduncle of the operculum has various crenations at the distal end. The opercular region proper is peculiar, for the wine-bowl-shaped lower part bears a somewhat bluntly conical operculum, which is definitely striated by longitudinal lines, apparently due to grooves. The operculum and its support thus form an ellipse.

The tips of the anterior bristles (Pl. XXXA. fig. 31) are not much tapered, and the wings are distinct, with a faintly serrated margin inferiorly. The wings, indeed, are proportionally broad inferiorly.

The anterior hooks (Pl. XXXA. fig. 32) are allied to those of *Pileolaria*[1] and *Placostegus*, showing a thickened rim furnished with very minute serrations anteriorly, and a larger tooth (corresponding to the great fang) with a somewhat blunt extremity inferiorly. In regard to the latter point, two are really present, though in profile only

[1] *Vide Pileolaria militaris*, Claparède, Annél. Chétop., p. 444, pl. xvi. fig. 5.

one is seen. Compared with the hook of *Placostegus assimilis*, the transverse striæ are much wider, while the hook on the whole is less.

The tube is comparatively smooth.

The hooks of this species seem to be minutely toothed, much more so than in the known forms. Their structure, indeed, approaches that of the genus *Omphalopoma* of Mörch,[1] but the conical nature of the operculum is characteristic.

Spirobranchus, Blainville.

Spirobranchus occidentalis, n. sp. (Pl. LV. fig. 10; Pl. XXIXA. figs. 31, 32).

Habitat.—Dredged at Station 33 (off the Bermudas), April 4, 1873; lat. 32° 21′ N., long. 64° 35′ W.; depth, 435 fathoms; surface temperature, 68°·0; sea-bottom, coral mud. It was attached to a tube of *Placostegus assimilis*.

The branchiæ have a sinuous arrangement, but such is probably due to their retraction within the tube on preservation in spirit, and they are only a little shorter than the body (the total for both being about 7 mm.). The radioles are marked by transverse wrinkles at somewhat regular intervals, and the tip of each ends in a smooth filiform process, slightly thickened distally. The terminal pinnæ reach as far outward as the latter.

The operculum had a short, horny, conical process (shaped somewhat like a hook) projecting from its surface, but it broke off before a figure could be made. This process was situated on an elevation near the edge most distant from the branchiæ, as usual in the group. The operculum is horny, blackish-brown in colour, and nearly circular. It is supported by a hollow membranous process, which is only a little constricted inferiorly, so that it is nearly cylindrical, the upper part of the peduncle being flattened out into a broad fan-shaped end to meet it. The cephalic collar is ample, presenting dorsally a large lateral lamella on each side of the median fissure, and being thrown into many frills ventrally, though no fissure occurs.

The anterior bristles (Pl. XXIXA. fig. 31) somewhat resemble those of the previous *Vermilia*, having a short tapering tip with well-marked wings, the edges of which are serrated.

The anterior hooks (Pl. XXIXA. fig. 32) have an elevated crown and a very long serrated edge, no less than eleven or twelve teeth occurring above the great fang. Moreover, the latter is produced in a remarkable way, and the tip is bifid. The dorsal line has a deep incurvation, but the ventral margin is nearly straight. There is a small truncated prow below the notch under the great fang. The striæ on the body of the

[1] *Op. cit.*, Revisio critica Serpulidarum, p. 421.

hook are wide, and have peculiar intermediate transverse markings, like those on certain feathers.

The tube forms a single coil, which measures from 3 to 5 mm. across, according to the direction of the axis; but a terminal piece apparently pertaining to it is not included in this calculation. The tube is finely marked with somewhat wavy transverse ridges, except on the free part, which has only one or two isolated transverse processes and some longitudinal ridges. The aperture of the tube is round. A smaller tube runs outside the foregoing in the attached portion at the margin.

The hooks thus differ from those of *Spirobranchus* (*Cymospira*) *giganteus*, Pall. (British Museum specimens, from St. Vincent, West Indies), in having a well-marked dorsal inflection, in the great projection of the anterior bifid process, and in the nature of the outline beneath the latter. The hooks of *Cymospira brachycera*, Baird, from Australia, also have a very diagnostic shape, the anterior inferior process being short and turned upward. A small form, *Cymospira decumbens*, Sowerby, occurs in the same collection from Van Diemen's Land, and differs from the Challenger form in the operculum and uncini. Grube does not figure the hooks of his Philippine species of *Spirobranchus* (*Serpula tricornigera* and *Serpula quadricornis*), and thus their relationship is in some respects uncertain.

Spirorbis, Daudin.

Spirorbis sp. (?)

Habitat.—A fragment occurred on Polyzoa dredged at Station 149G (off Christmas Harbour, Kerguelen), January 29, 1874; lat. 48° 50′ S., long. 69° 18′ E.; depth, 110 fathoms; surface temperature, 40°·2; sea-bottom, volcanic mud.

A fragment of a coiled tube, apparently belonging to the Serpulidæ, comes from the Admiralty Islands. It has a diameter of 2·5 mm. and a length of 17 mm., is marked by transverse wrinkles and a few longitudinal furrows. It is nearly round, the attached parts being flattened, and a slight ridge occurring here and there. A spinous *Lepralia* is attached to a sheltered portion of the external surface.

Another empty, smoothly rounded tube, somewhat regularly coiled round a central axis which is hollow, was trawled at Station 201 (off the Philippines, Basilan Strait), October 26, 1874; lat. 7° 3′ S., long. 121° 48′ E.; depth, 82 fathoms; surface temperature, 83°·0; sea-bottom covered with stones and gravel. The tube is a long one, with a diameter at its widest part of 2·5 mm. This coiled arrangement round an oblique (hollow) axis is peculiar. Externally are various *Lepraliæ*.

A fragmentary calcareous tube occurs in a slight groove (apparently formed by the animal) on a nodule of manganese trawled at Station 289 (in the middle of the Pacific), October 23, 1875; lat. 39° 41′ S., long. 131° 23′ W.; depth, 2550 fathoms; bottom temperature 34°·8, surface temperature 54°·5; sea-bottom, red clay. The track is little more than half a line in diameter, and as only the attached part of the tube (lower curve) remains, it is difficult to say whether we are dealing with a perfect or imperfect organism. The softness of the calcareous track causes some doubt as to the nature of the structure.

Ditrypa, Berkeley.

Ditrypa arietina, O. F. Müller (Pl. LIV. fig. 6).

Habitat.—Dead tubes inhabited by *Sipunculi*, and with adherent patches of Nullipore, were dredged off Tenerife in 70 fathoms, February 10, 1874. Similar tubes, inhabited by Gephyreans, occurred at Station 75 (off Fayal, Azores), July 2, 1873; lat. 38° 38′ N., long. 28° 28′ W.; depth, 450 fathoms; sea-bottom, volcanic mud. The same species was dredged in the "Knight Errant," at Station 3, August 3 and 4, 1880; lat. 59° 12′ N., long. 5° 57′ W.; depth, 53 fathoms, off the island of North Rona.

The specimens agree in appearance with those from the Mediterranean, the tubes being marked transversely with brownish bars.

Grube[1] in his Philippine Annelids describes a new species (*Ditrypa gracillima*), which does not, however, seem to differ essentially from the typical form.

A peculiar fusiform glistening porcellanous tube comes from 470 and 390 fathoms off Sombrero and St. Thomas, West Indies, but as it contains nothing but mud its position is uncertain.

Family Tomopteridæ.

Tomopteris, Eschscholtz.

? *Tomopteris carpenteri*, De Quatrefages.

Tomopteris carpenteri, De Quatrefages, Hist. Nat. des Annél., p. 227, pl. xx. figs. 1, 2.

Habitat.—Found in considerable numbers at the surface of the sea between Kerguelen and Macdonald Islands, February 2, 1874.

[1] *Op. cit.*, p. 279.

I agree with Vejdovsky[1] in considering this species requires further investigation. Thus the cup on the ventral division of the feet occurs in the forms procured by the "Knight Errant" and "Triton" in 1880 and 1882.

A fragmentary form, too much injured for identification, was procured in the Atlantic, February 28, 1873.

Tomopteris onisciformis, Eschscholtz.

Tomopteris onisciformis, Eschscholtz, Isis, t. xvi. p. 736, pl. v. fig. 5.

A species apparently identical with this form, so well known from the observations of Dr. Carpenter, M. Claparède, Prof. Allman, and others, in our own seas, was procured in considerable numbers in the "Triton" and "Knight Errant."

H.M.S. "Knight Errant," 1880.

Station 10, July 28, surface.

H.M.S. "Triton," 1882.

Surface to 12 fathoms,	.	.	August 4	Surface to	600 fathoms,	..	August 21
Surface,	.	.	„ 7	„	600 „	.	„ 22
Surface to 100 to 150 fathoms,			„ 9	„	40 „	.	„ 24
Surface,	.	.	„ 10	„	40 „	.	„ 28
Surface to 40 fathoms,	.	.	„ 20	„	40 „	.	„ 30
„ 300 „	.	.	„ „	„	about 400 „	.	„ „
„ 400 „	.	.	„ „	„	40 „	.	„ 31
„ 600 „	.	.	„ „				

Like many other pelagic animals, this species is found not only at the surface but at considerable depths. The main obstacle to accuracy is the difficulty in adjusting the tow-nets, so that they shut before being drawn from such depths. The most recent kind (the Turbyne net[2]) seems to have certain practical advantages over its predecessors, but it yet requires thorough testing.

[1] *Zeitschr. f. wiss. Zool.*, Bd. xxxi. p. 96. Besides this interesting paper, some valuable remarks are given by Greeff in the subsequent volume of the *Zeitschr. f. wiss. Zool.*, viz., Bd. xxxii. p. 256.

[2] The Scottish Marine Station, Granton, Its Work, &c., p. 21, pl. ii., 1885.

SYNOPSIS OF THE FAMILIES, GENERA, AND SPECIES DESCRIBED IN THE FOREGOING REPORT.

		PAGE
Family Euphrosynidæ,		1
Euphrosyne, Savigny,		1
Euphrosyne capensis, Kinb.,	Pl. II. fig. 5; Pl. Ia. figs. 1–3	1
„ *borealis*, Œrst.,	Pl. I. figs. 2, 3; Pl. Ia. figs. 4–6	5
Family Amphinomidæ,		6
Chloeia, Savigny,		8
Chloeia flava (Pall.),	Pl. III. figs. 1, 3; Pl. Ia. figs. 7–9	8
„ *fusca*, n. sp.,	Pl. II. figs. 1, 2; Pl. Ia. figs. 14, 15; Pl. IIa. figs. 1, 2	14
Chloenea, Kinberg,		15
Chloenea atlantica, n. sp.,	Pl. I. fig. 4; Pl. Ia. figs. 10–13	15
Notopygos, Grube,		17
Notopygos megalops, n. sp.,	Pl. I. fig. 1; Pl. IIa. figs. 3, 4	17
„ *labiatus*, n. sp.,	Pl. II. fig. 6; Pl. IV. fig. 2; Pl. IIa. figs. 5, 6	19
Amphinome, Bruguière,		21
Amphinome rostrata (Pall.),	Pl. I. fig. 7; Pl. IV. fig. 1; Pl. Ia. fig. 16; Pl. IIa. figs. 9–11	21
Hermodice, Kinberg,		24
Hermodice carunculata, Pall,	Pl. V.; Pl. IIIa. figs. 1–3	24
Eurythoë, Kinberg,		27
Eurythoë pacifica, Kinb.,	Pl. II. figs. 3, 4; Pl. III. fig. 2; Pl. IIa. fig. 13; Pl. IIIa. figs. 5–9	27
„ „ var. *levukaensis*,	Pl. XVI. fig. 5; Pl. IIa. fig. 14; Pl. IIIa. figs. 10, 11	29
Hipponoë, Aud. and Edw.,		30
Hipponoë gaudichaudi, Aud. and Edw.,	Pl. I. fig. 5; Pl. IV. fig. 3; Pl. IIIa. figs. 13–17	30
Family Aphroditidæ,		33
Aphrodita, Linné,		34
Aphrodita aculeata, L.,		34
„ *australis*, Baird,	Pl. VI. figs. 6, 7; Pl. VIa. figs. 4–7	34
„ *echidna*, De Quatref.,	Pl. VII. figs. 1, 2; Pl. VIa. figs. 2, 3	36
„ *intermedia*, n. sp.,	Pl. I. fig. 6; Pl. VIa. fig. 1	38
Hermione, Blainville,		39
Hermione hystrix (Sav.),	Pl. VIII. fig. 3	39
Lætmonice, Kinberg,		39
Lætmonice filicornis, Kinberg,	Pl. Va. fig. 7	39
„ *producta*, Grube,	Pl. VI. figs. 1, 2; Pl. IVa. figs. 1–8	39
„ „ var. *wyvillei*,	Pl. VII. fig. 3; Pl. IVa. figs. 9–11	44
„ „ var. *benthaliana*,	Pl. VIII. figs. 4, 5; Pl. IVa. fig. 12; Pl. Va. figs. 1, 2	45
„ „ var. *willemoesi*,	Pl. VI. fig. 3; Pl. Va. figs. 3, 4	47
„ „ var. *assimilis*,	Pl. VIII. fig. 2; Pl. Va. figs. 5–8	49
„ *japonica*, n. sp.,	Pl. VIII. fig. 1; Pl. IVa. fig. 13; Pl. Va. figs. 9, 10	50
„ *aphroditoides*, n. sp.,	Pl. VII. figs. 4, 5; Pl. Va. figs. 11–15	51

		PAGE
Family Palmyridæ,		53
Palmyra, Savigny,		53
Palmyra aurifera, Savigny,	Pl. IX. figs. 1, 2; Pl. VIa. figs. 8, 9	53
Family Polynoidæ,		56
Iphionella, n. gen.,		58
Iphionella cimex, De Quatref.,	Pls. IX. figs. 4–6; Pl. XVII. fig. 3; Pl. VIIIa. figs. 7, 8	58
Euphione, n. gen.,		62
Euphione elisabethæ, n. sp.,	Pl. IX. fig. 3; Pl. XVII. fig. 7; Pl. XVIII. fig. 10; Pl. VIIIa. figs. 3–6	62
Lepidonotus (Leach),		64
Lepidonotus squamatus, L.,		64
„ *gymnonotus*, Marenz.,	Pl. X. fig. 4; Pl. XVII. fig. 5; Pl. IXa. figs. 2, 3	64
„ *wahlbergi*, Kinb.,	Pl. XI. fig. 1; Pl. XVIII. fig. 8; Pl. Xa. figs. 15, 16	66
„ *cristatus*, Grube,	Pl. XI. figs. 2, 3; Pl. XVII. fig. 1; Pl. Xa. figs. 10, 11	67
Eunoa, Malmgren,		69
Eunoa iphionoides, n. sp.,	Pl. XVII. fig. 4; Pl. VIIIa. figs. 1, 2	69
„ *opalina*, n. sp.,	Pl. X. fig. 5; Pl. XIX. fig. 2; Pl. VIIIa. figs. 9–11	71
„ *capensis*, n. sp.,	Pl. XV. fig. 5; Pl. XIa. figs. 1–3	72
„ *abyssorum*, n. sp.,	Pl. XIa. figs. 14–16	73
„ *mindanuvensis*, n. sp.,	Pl. XI. fig. 6; Pl. XVII. fig. 6; Pl. XIIa. figs. 7, 8	74
„ *yedoensis*, n. sp.,	Pl. XV. fig. 4; Pl. XIX. fig. 9; Pl. Xa. figs. 11, 12	75
Polyeunoa, n. gen.,		76
Polyeunoa lævis, n. sp.,	Pl. XII. fig. 2; Pl. XX. fig. 8; Pl. VIIa. figs. 12, 13	76
Dasylepis, Malmgren,		77
Dasylepis equitis, n. sp.,	Pl. XXXIIa. fig. 7; Pl. XXXIXa. figs. 5, 6	77
Lagisca, Malmgren,		78
Lagisca propinqua, Malmgren,	Pl. VIIa. figs. 5–9	78
„ *tenuisetis*, n. sp.,	Pl. II. fig. 7; Pl. XVIII. fig. 9; Pl. VIIa. figs. 5–9	78
„ *antarctica*, n. sp.,	Pl. XIII. fig. 1; Pl. XVI. fig. 3; Pl. XVIII. fig. 1; Pl. VIa. figs. 10, 11	80
„ *magellanica*, n. sp.,	Pl. XIII. fig. 5; Pl. XVIII. figs. 3, 4; Pl. VIIa. figs. 1, 2	82
„ „ var., *murrayi*, nov.,	Pl. XIX. fig. 1; Pl. IXa. figs. 13, 14	83
„ „ var. *grubei*, nov.,	Pl. III. fig. 5; Pl. XVIII. fig. 2; Pl. VIIa. figs. 14–16	84
„ *peracuta*, n. sp.,	Pl. IV. fig. 6; Pl. VIIa. figs. 10, 11	85
„ (*Agnodice*) *moseleyi*, n. sp.,	Pl. VI. fig. 6; Pl. Xa. figs. 7, 8	87
„ *crosetensis*, n. sp.,	Pl. VIII. fig. 6; Pl. XIII. fig. 2; Pl. XVIII. fig. 7; Pl. XIa. figs. 4–6	88
„ *yokohamiensis*, n. sp.,	Pl. XIa. figs. 12, 13	89
„ *darwini*, n. sp.,	Pl. VI. fig. 5; Pl. XIX. fig. 5; Pl. XIIa. figs. 1–3	90
„ (?) *kermadecensis*, n. sp.,	Pl. XIII. fig. 8; Pl. XIIa. figs. 4–6	93
„ (?) *hexactinellidæ*, n. sp.,	Pl. IV. fig. 5; Pl. XIIa. figs. 14–16	94
Eulagisca, n. gen.,		91
Eulagisca corrientis, n. sp.,	Pl. XIII. fig. 4; Pl. VIIa. figs. 3, 4	91
Harmothoë, Kinberg,		95
Harmothoë benthaliana, n. sp.,	Pl. XIII. fig. 3; Pl. XX. fig. 7; Pl. Xa. figs. 9, 10	95
„ *haliaëti*, M'I.,		96
Evarne, Malmgren,		97
Evarne kerguelensis, n. sp.,	Pl. VI. fig. 4; Pl. XIX. fig. 6; Pl. VIa. figs. 12–14	97
„ *tenuisetis*, n. sp.,	Pl. IXa. figs. 11–12	99
Lænilla, Malmgren,		99
Lænilla fusca, n. sp.,	Pl. XIV. fig. 3; Pl. VIIIa. figs. 12, 13	100

PAGE

Eupolynoë, M'Intosh, ... 101
Eupolynoë mollis, M'I., ... 101
Allmaniella, n. gen., ... 102
Allmaniella setubalensis, n. sp., . . . Pl. XIV. fig. 2; Pl. Xa. figs. 3, 4 102
Scalisetosus, n. gen., ... 103
Scalisetosus ceramensis, n. sp., ... Pl. Xa. figs. 13, 14 103
Hermadion, Kinberg, ... 105
Hermadion kerguelensis, n. sp., ... Pl. XI. fig. 5; Pl. XII. fig. 1 105
Polynoë, Savigny, ... 108
Polynoë (*Langerhansia*) *euplectellæ*, n. sp., Pl. XV. fig. 6; Pl. XIX. fig. 7; Pl. IXa. figs. 8, 9 108
„ (*?*) *ascidioides*, n. sp., ... Pl. XXXIIIa. figs. 3, 4 109
„ *platycirrata*, n. sp., Pl. III. fig. 4; Pl. XVI. fig. 2; Pl. XIX. fig. 3; Pl. VIIIa. figs. 14, 15; Pl. IXa. fig. 1, ... 111
„ *capensis*, n. sp., Pl. IV. fig. 4; Pl. XV. fig. 1; Pl. XIX. fig. 4; Pl. IXa. figs. 4, 5, 114
„ *pustulata*, n. sp., . . . Pl. X. fig. 3; Pl. XVII. fig. 2; Pl. IXa. figs. 6, 7 115
„ (*Lepidonotus*) *iphionoides*, n. sp., . . . Pl. X. figs. 1, 2; Pl. Xa. figs. 1, 2 116
„ *magnipalpa*, n. sp., Pl. XIII. fig. 6; Pl. XIV. fig. 1; Pl. XVIII. fig. 5; Pl. Xa. figs. 5, 6 118
„ *attenuata*, n. sp., . . Pl. XV. fig. 2; Pl. XX. fig. 9; Pl. XIa. figs. 8, 9 120
„ (*Macellicephala*) *mirabilis*, n. sp., . . Pl. XVI. fig. 1; Pl. XIIa. figs. 9–11 121
„ (*Robertianella*) *synophthalma*, n. sp., Pl. XIV. fig. 4; Pl. XX. fig. 5; Pl. XIIa. figs. 12, 13, ... 122
„ (*Admetella*) *longipedata*, n. sp., Pl. XIV. fig. 5; Pl. XX. fig. 6; Pl. XIIa. fig. 17 124
„ *ocellata*, n. sp., ... Pl. XII. fig. 3; Pl. XIIa. figs. 18, 19 126
Polynoëlla, n. gen., ... 128
Polynoëlla levisetosa, n. sp., Pl. XI. fig. 4; Pl. XV. fig. 3; Pl. XVI. fig. 4; Pl. XVIII. fig. 6; Pl. XIX. fig. 8; Pl. XIa. fig. 7; Pl. XXXIIa. fig. 6, . . . 128
Eulepis, Grube, ... 131
Eulepis wyvillei, n. sp., Pl. XIX. fig. 11; Pl. XX. figs. 2, 3; Pl. XXIV. figs. 2, 3; Pl. XXV. fig. 11; Pl. XIVa. figs. 4–6; Pl. XXXIIa. fig. 7, ... 131
„ *challengeriæ*, n. sp., Pl. XX. fig. 1; Pl. XXIII. fig. 1; Pl. XXIV. fig. 1; Pl. XIVa. figs. 7, 8, ... 134

Family Acoetidæ, ... 135
Eupompe, Kinberg, ... 135
Eupompe australiensis, n. sp., Pl. XXI. figs. 4, 5; Pl. XXIII. fig. 8; Pl. XXIV. fig. 4; Pl. XIIIa. figs. 2–6, ... 135

Family Sigalionidæ, ... 139
Thalenessa (Baird), ... 139
Thalenessa digitata, n. sp., Pl. XXII. fig. 2; Pl. XXIII. figs. 5–7; Pl. XXV. figs. 4, 5; Pl. XIIIa. figs. 7–10, ... 140
„ *oculata*, n. sp., Pl. XXI. figs. 1, 2; Pl. XXIII. fig. 12; Pl. XXV. fig. 3; Pl. XIIIa. figs. 11, 12, ... 142
„ *fimbriata*, n. sp., Pl. XIX. fig. 10; Pl. XXIII. fig. 4; Pl. XXIV. fig. 5; Pl. XXV. figs. 1, 2; Pl. XIIIa. fig. 13, . . . 144
Sigalion, Milne-Edwards, ... 145
Sigalion buskii, M'I., ... Pl. XXII. fig. 1 145
Psammolyce, Kinberg, ... 146
Psammolyce occidentalis, n. sp., Pl. XXII. fig. 5; Pl. XXIII. figs. 2, 3; Pl. XXVII. fig. 6; Pl. XIIIa. figs. 14, 15, ... 146

PAGE

Psammolyce fijiensis, n. sp., Pl. XXI. fig. 6; Pl. XXII. fig. 4; Pl. XXIV. fig. 6; Pl. XIIIA. fig. 18, ... 148
Leanira, Kinberg, ... 150
Leanira magellanica, n. sp., Pl. XXI. fig. 7; Pl. XXIII. fig. 13; Pl. XXV. figs. 6, 7; Pl. XIIIA. figs. 19, 20, ... 150
„ *areolata*, n. sp., . Pl. XXI. fig. 3; Pl. XXV. figs. 8, 9; Pl. XIIIA. fig. 1 151
„ *japonica*, n. sp., ... Pl. XXII. fig. 3; Pl. XIVA. figs. 1, 2 154
„ *hystricis*, Ehlers, ... Pl. XXIII. fig. 9 155
„ *lævis*, n. sp., . . . Pl. XX. fig. 4; Pl. XXIII. figs. 10, 11 156
Eupholoë, n. gen., ... 157
Eupholoë philippensis, n. sp., Pl. XXII. figs. 6, 7; Pl. XXIV. fig. 7; Pl. XXV. fig. 10; Pl. XIIIA. figs. 16, 17, ... 157

Family NEPHTHYDIDÆ, ... 159
Nephthys, Cuvier, ... 159
Nephthys trissophyllus, Gr., Pl. XXVI. figs. 1–5; Pl. XXVII. figs. 1, 4; Pl. XXX. fig. 8; Pl. XIVA. figs. 9–11, ... 159
„ *dibranchis*, Gr., . . . Pl. XXVI. figs. 8, 9; Pl. XXVII. fig. 5 161
„ *verrilli*, n. sp., . . . Pl. XXVI. figs. 6, 7; Pl. XXXIIA. fig. 8 163
„ *phyllobranchia*, n. sp., Pl. XXVI. fig. 10; Pl. XXVII. fig. 3; Pl. XIVA. figs. 12, 13 164
„ *malmgreni*, Theel (?), ... Pl. XXVII. fig. 2 165

Family PHYLLODOCIDÆ, ... 165
Phyllodoce, Savigny, ... 166
Phyllodoce (*Anaitis*) *sancti-vincentis*, n. sp. Pl. XXVII. fig. 9; Pl. XXXII. fig. 8; Pl. XIVA. figs. 14, 15, ... 166
„ *duplex*, n. sp., . Pl. XXVII. fig. 8; Pl. XXXII. fig. 9; Pl. XVA. fig. 1 167
Eulalia, Savigny, ... 168
Eulalia capensis, Schm., Pl. XXVII. fig. 7; Pl. XXXII. fig. 10; Pl. XIVA. figs. 16, 17 168
Genetyllis, Malmgren, ... 169
Genetyllis (?) *oculata*, n. sp., Pl. XXVIII. fig. 1; Pl. XVA. figs. 2, 3; Pl. XXXIIIA. figs. 1–8 169

Family ALCIOPIDÆ, ... 173
Alciopa, Milne-Edwards, ... 175
Alciopa antarctica, n. sp., . . . Pl. XXVIII. figs. 2–4; Pl. XXXII. fig. 12 175
„ (?) *quadrioculata*, n. sp., . . . Pl. XXVIII. fig. 8; Pl. XXIX. fig. 7 176
„ (?) sp., ... Pl. XXXII. fig. 13 177
Halodora, Greeff, ... 178
Halodora reynaudii, Aud. and Edw., Pl. XXXIIIA. figs. 1, 10–12, 14–18, 20–22; Pl. XXXIVA. figs. 1, 3–6, ... 178
Greeffia (*Nauphanta*), Greeff, ... 182
Greeffia oahuensis, n. sp., . Pl. XXVIII. figs. 5–7; Pl. XXXII. fig. 11; Pl. XVA. fig. 4 182

Family HESIONIDÆ, ... 183
Hesione, Savigny, ... 184
Hesione pacifica, n. sp., ... Pl. XXIX. fig. 2; Pl. XXXII. fig. 14 184
„ (*Fallacia*) *pantherina*, Risso, Pl. XXIX. fig. 1; Pl. XXXII. fig. 16; Pl. XVA. fig. 10 185
„ (?) sp., ... Pl. XXXII. fig. 15; Pl. XVA. figs. 8, 9 186
Dalhousia, n. gen., ... 186
Dalhousia atlantica, n. sp., . Pl. XXIX. fig. 3; Pl. XXXIII. fig. 2; Pl. XVA. figs. 5–7 186
Salvatoria, n. gen., ... 188
Salvatoria kerguelensis, n. sp., Pl. XXX. fig. 4; Pl. XXXIII. fig. 1; Pl. XVA. figs. 11, 12 188

PAGE

Family Syllidæ, ... 189
Eusyllis, Malmgren, ... 190
Eusyllis tubifex, Gosse, ... 190
„ *kerguelensis*, n. sp., . Pl. XXIX. fig. 4; Pl. XXXIII. fig. 3; Pl. XVa. fig. 13 191
Syllis Savigny (Grube), ... 193
Syllis capensis, n. sp., . . . Pl. XXXIII. figs. 8, 9; Pl. XVa. fig. 21 193
„ *gigantea*, n. sp., Pl. XXX. figs. 1–3; Pl. XXXIII. fig. 4; Pl. XVa. fig. 14; Pl. XXXIVa. fig. 7, ... 193
„ *setubalensis*, n. sp., Pl. XXX. figs. 5, 6; Pl. XXXIII. fig. 6; Pl. XVa. figs. 16, 17 195
„ *brasiliensis*, n. sp., . Pl. XXX. fig. 7; Pl. XXXIII. fig. 7; Pl. XVa. fig. 20 196
„ *robertianæ*, n. sp., . . . Pl. XXXIV. figs. 1, 2; Pl. XXIXa. fig. 14 197
„ *ramosa*, M'I., Pl. XXXI. fig. 1; Pl. XXXIII. figs. 11–14; Pl. XVa. figs. 18, 19; Pl. XVIa. fig. 1; Pl. XXXIVa. figs. 8–10, 12, 13, ... 198
Exogone, Œrsted, ... 205
Exogone heterosetosa, n. sp., . . . Pl. XXXIII. figs. 15, 16; Pl. XXIVa. fig. 11 205
Sphærosyllis, Claparède, ... 206
Sphærosyllis kerguelensis, n. sp., Pl. XXIX. fig. 5; Pl. XXXIII. fig. 10; Pl. XVa. fig. 22 206
Autolytus, Grube, ... 207
Autolytus maclearanus, n. sp., Pl. XXIX. fig. 6; Pl. XXXIII. fig. 5; Pl. XVa. fig. 15 207

Family Nereidæ, ... 208
Nereis, Linné, ... 210
Nereis (*Platynereis*) *kobiensis*, n. sp., . . Pl. XXXIV. figs. 3–6; Pl. XVIa. figs. 2–4 210
„ „ *tongatabuensis*, n. sp., . Pl. XXXIV. figs. 7–9; Pl. XVIa. figs. 5–7 212
„ „ *arafurensis*, n. sp., . . . Pl. XXXIV. figs. 10–13 214
„ (*Lycoris ?*) *pelagica*, L., ... 216
„ (*Perinereis*) *melanocephala*, n. sp., . Pl. XXXIV. figs. 14–17; Pl. XVIa. figs. 8, 9 216
„ *atlantica*, n. sp., . . . Pl. XXXV. figs. 1–3; Pl. XVIa. figs. 10, 11 219
„ *dumerilii*, Aud. and Edw., var., ... 221
„ *longisetis*, n. sp., . . . Pl. XXXV. fig. 4; Pl. XVIa. figs. 12, 13, 19 222
„ (*Platynereis*) *eatoni*, M'I., ... Pl. XXXV. figs. 5, 6 223
„ *antillensis*, n. sp., . . . Pl. XXXV. figs. 7–9; Pl. XVIa. figs. 14–16 224
„ *kerguelensis*, Baird (?), . . Pl. XXXV. figs. 10–12; Pl. XVIa. figs. 17, 18 225
„ *patagonica*, n. sp., . . . Pl. XXXV. figs. 13–15; Pl. XVIIa. figs. 1, 2 228
„ (*Ceratonereis*) *brasiliensis*, n. sp., . Pl. XXXVI. figs. 1–3; Pl. XVIIa. figs. 3, 4 230

Family Staurocephalidæ, ... 231
Staurocephalus, Grube, ... 232
Staurocephalus australiensis, n. sp., . . Pl. XXXVI. fig. 6; Pl. XVIIIa. figs. 9, 10 232
„ *atlanticus*, n. sp., . . Pl. XXXVI. figs. 4, 5; Pl. XVIIa. figs. 5–8 233

Family Lumbrinereidæ, ... 235
Notocirrus, Schmarda, ... 236
Notocirrus capensis, n. sp., . . . Pl. XXXVII. figs. 3, 4; Pl. XVIIIa. fig. 15 236
Laranda, Kinberg, ... 237
Laranda longa Webster, . Pl. XXX. fig. 10; Pl. XXXVII. fig. 5; woodcut fig. 3 337
Lumbriconereis, Blainville (*Zygolobus*, Grube), ... 239
Lumbriconereis pettigrewi, n. sp., Pl. XXXVI. figs. 7–9; Pl. XVIIa. figs. 11–15; woodcuts 4–6 239
„ *bifurcata*, n. sp., Pl. XXXVI. figs. 10–12; Pl. XVIIa. fig. 16; woodcuts 7, 8 241
„ *japonica*, Marenzeller, Pl. XXXVI. figs. 13–15; Pl. XVIIa. fig. 17; Pl. XVIIIa. fig. 1; woodcuts 9–11, ... 243

PAGE

Lumbriconereis kerguelensis, Gr., Pl. XXXVI. figs. 16, 17 ; Pl. XVIIA. fig. 18 ; Pl. XVIIIA. figs. 2–4 ; woodcuts 12, 13, ... 246
„ *neo-zealaniæ*, n. sp., Pl. XXXVI. figs. 18, 19 ; Pl. XVIIIA. figs. 5–9; woodcuts 14, 15, ... 248
„ *abyssorum*, n. sp., Pl. XXXVI. figs. 20, 21 ; Pl. XVIIIA. fig. 10 ; woodcuts 16–18, ... 250
„ *punctata*, n. sp., . Pl. XXX. fig. 9; Pl. XVIIIA. fig. 11 ; woodcut 19 252
„ *ehlersii*, n. sp., var. *tenuisetis*, nov., Pl. XXXVII. fig. 9; Pl. XVIIIA. fig. 12 ; woodcuts 20–22, ... 253
„ *heteropoda*, Marenz., Pl. XXXVII. figs. 1, 2 ; Pl. XVIIIA. figs. 13, 14; woodcuts 23–25, ... 255
Palolo, J. E. Gray, ... 257
Palolo viridis, Gray, ... Pl. XVIIIA. figs. 20, 21 257
Family EUNICIDÆ, ... 261
Nematonereis, Schmarda, ... 262
Nematonereis schmardæ, n. sp., Pl. XXXVII. figs. 6–8 ; Pl. XVIIIA. figs. 16–19 ; woodcuts 26, 27, ... 262
„ sp. (Cape Town), . . Pl. XXXVII. fig. 10 ; Pl. XIXA. figs. 1, 2 264
„ sp. (St. Vincent), . . Pl. XXXVII. fig. 11 ; Pl. XIXA. figs. 3–5 264
Eunice, Cuvier, ... 265
Eunice magellanica, n. sp., . . . Pl. XXXVII. figs. 12–15 ; Pl. XIXA. figs. 6–9 265
„ „ (young), ... 267
„ *prognatha*, n. sp., Pl. XXXVII. figs. 16, 17 ; Pl. XIXA. figs. 10, 11 ; woodcuts 29–31 268
„ *torresiensis*, n. sp., Pl. XXXVII. figs. 18–21 ; Pl. XIXA. figs. 12, 13 ; woodcuts 32, 33 270
„ *ærstedi* (?), Stimpson, Pl. XXXVIII. figs. 1, 2 ; Pl. XIXA. figs. 14, 15 ; woodcuts 34, 35 273
„ *vittata*, D. Ch., . Pl. XXXIX. fig. 18; Pl. XXIA. figs. 10, 11 ; woodcut 36 275
„ „ var., . . . Pl. XXXVIII. figs. 3–5 ; Pl. XIXA. figs. 16, 17 276
„ *cirrobranchiata*, n. sp., . Pl. XXXVIII. figs. 9–11 ; Pl. XIXA. figs. 21–24 277
„ *kobiensis*, n. sp., Pl. XXXVIII. figs. 12, 13; Pl. XXA. figs. 1, 3; woodcuts 37, 38 278
„ *edwardsi*, n. sp., Pl. XXXVIII. figs. 14, 15; Pl. XXA. figs. 4–7 ; woodcuts 39, 40 280
„ *aphroditois*, Pall., Pl. XXXVIII. figs. 16, 17; Pl. XXA. figs. 8–10; woodcuts 41–43 282
„ *torquata*, De Quatref., Pl. XXXVIII. fig. 18; Pl. XXA. figs. 11–13; woodcuts 44, 45 285
„ *elseyi*, Baird, . Pl. XXXIX. figs. 1–3; Pl. XXA. figs. 14–16; woodcuts 46, 47 286
„ *murrayi*, n. sp., Pl. XXXIX. figs. 7, 8; Pl. XXA. figs. 19, 20; woodcuts 48, 49 288
„ *mindanavensis*, n. sp., Pl. XXXIX. figs. 9, 10; Pl. XXA. figs. 21, 22; woodcuts 50, 51 289
„ *equibranchiata*, n. sp., . . . Pl. XXXIX. fig. 11; Pl. XXA. figs. 23, 24 291
„ *barvicensis*, n. sp., Pl. XXXIX. fig. 12; Pl. XXIA. figs. 1–3; woodcuts 52, 53 292
„ *pycnobranchiata*, n. sp., Pl. XXXIX. figs. 13–15 ; Pl. XXIA. figs. 4, 5; woodcuts 54, 55 294
„ *tribranchiata*, n. sp., ... Pl. XXIA. figs. 6, 7 297
„ *bassensis*, n. sp., . . . Pl. XXXIX. fig. 16; Pl. XXIA. figs. 8, 9 298
„ (?) sp. (Bermuda), . . . Pl. XXXIX. fig. 19; Pl. XXIA. figs. 12–14 299
Marphysa, De Quatrefages, ... 299
Marphysa goodsiri, n. sp., Pl. XXXVIII. figs. 6–8, 19; Pl. XIXA. figs. 18–20; woodcuts 56, 57 299
Nicidon, Kinberg, ... 301
Nicidon balfouriana, n. sp., Pl. XXXIX. figs. 4–6 ; Pl. XXA. figs. 17, 18 ; woodcuts 58, 59 301
Macduffia, n. gen., ... 303
Macduffia bonhardi, n. sp., . Pl. XXXIX. figs. 20–22 ; Pl. XXA. fig. 26; woodcut 60 303
Family ONUPHIDIDÆ, ... 304
Nothria, Johnston, ... 305

		PAGE
Nothria conchylega, Sars,	woodcuts 61, 62	305
„ *tenuisetis*, n. sp.,	Pl. XL. figs. 8, 9; Pl. XXIa. figs. 24–26; woodcuts 63–65	307
„ *sombreriana*, n. sp.,	Pl. XL. figs. 5–7; Pl. XXIa. figs. 19–23; woodcuts 66–69	310
„ „ var.,	woodcuts 70, 71	313
„ *abranchiata*, n. sp.,	Pl. XL. figs. 10–12; Pl. XXIa. fig. 27; Pl. XXIIa. figs. 1–3; woodcuts 72, 73,	314
„ *pycnobranchiata*, n. sp.,	Pl. XL. figs. 13–15; Pl. XXIIa. figs. 4, 5; woodcuts 74–76	317
„ *macrobranchiata*, n. sp.,	Pl. XLI. figs. 1–3; Pl. XXIIa. figs. 6, 7; woodcuts 77, 78	320
„ *willemoesii*, n. sp.,	Pl. XLI. figs. 4–10; Pl. XXVIa. figs. 1–4; Pl. XXXVa. fig. 1; woodcuts 79, 80,	322
„ *ehlersi*, n. sp.,	Pl. XLII. figs. 1–3; Pl. XXVIa. figs. 5–7; Pl. XXXVa. fig. 2; woodcuts 81–83,	327
„ *armandi*, n. sp.,	Pl. XLI. figs. 11–13; Pl. XXVIa. figs. 8–10; woodcut 84	330
„ *quadricuspis*, M. Sars,	woodcuts 85, 86	332
„ *minuta*, n. sp.,	Pl. XL. fig. 4; Pl. XXIa. figs. 17, 18; woodcut 87	334
Hyalinœcia, Malmgren,		335
Hyalinœcia tubicola, O. F. M.,		335
„ „ var.,	Pl. XL. fig. 1; woodcuts 88, 89	336
„ „ var. *longibranchiata*, nov.,	Pl. XL. fig. 2; woodcut 90	337
„ „ var. *papuensis*, nov.,	woodcut 91	339
„ *benthaliana*, n. sp.,	Pl. XL. fig. 3; Pl. XXIa. figs. 15, 16	339
„ *bilineata*, Baird,		340
Family Goniadidæ,		341
Eone, Malmgren,		341
Eone trifida, n. sp.,	Pl. XLII. fig. 4; Pl. XXIIa. figs. 8, 9	341
Family Glyceridæ,		342
Glycera, Savigny,		343
Glycera tessellata, Grube,	Pl. XLII. fig. 5	343
„ *capitata*, Œrst.,		343
„ *kerguelensis*, n. sp.,	Pl. XXXVa. figs. 3, 4	344
„ *amboinensis*, n. sp.,	Pl. XLII. figs. 6, 7	345
„ *sagittariæ*, n. sp.,	Pl. XLII. fig. 8; Pl. XXIIa. fig. 10	346
„ *lamelliformis*, n. sp.,	Pl. XLII. figs. 9, 10; Pl. XXIIa. fig. 11	347
Hemipodus, De Quatrefages,		349
Hemipodus magellanicus, n. sp.,	Pl. XLII. figs. 11–15; Pl. XXIIa. figs. 12–15; Pl. XXXVa. figs. 5–7,	349
Family Aricidæ,		352
Aricia, Savigny,		352
Aricia norvegica, M. Sars,		352
„ *platycephala*, n. sp.,	Pl. XLIII. figs. 1–3; Pl. XXIIa. figs. 16, 17	353
Aricidea, Webster,		354
Aricidea fragilis, Webster,	Pl. XLIII. figs. 4, 5; Pl. XXIIa. fig. 18	354
Scoloplos, (Blainville) Œrsted,		355
Scoloplos kerguelensis, n. sp.,	Pl. XLIII. figs. 6–8; Pl. XXIIa. fig. 19	355
Family Opheliidæ,		357
Ammotrypane, H. Rathke,		357
Ammotrypane gracile, n. sp.,	Pl. XLIII. figs. 9, 12	357

		PAGE
Travisia, Johnston,		357
Travisia kerguelensis, n. sp.,	Pl. XLIII. fig. 10; Pl. XXXVIA. figs. 1, 2	357
Family Scalibregmidæ,		359
Scalibregma, H. Rathke,		359
Scalibregma inflatum, H. Rathke, var.,	Pl. XLIV. figs. 3, 4; Pl. XXIIA. fig. 21	359
Eumenia, Œrsted,		360
Eumenia reticulata, n. sp.,	Pl. XLIV. figs. 1, 2; Pl. XXIIA. fig. 20	360
Family Sphærodoridæ,		361
Ephesia, H. Rathke,		361
Ephesia antarctica, n. sp.,	Pl. XLIV. fig. 5; Pl. XXIIA. figs. 22, 23	361
Family Chloræmidæ,		362
Trophonia, Milne-Edwards,		363
Trophonia capensis, n. sp.,	Pl. XLIV. figs. 7, 8; Pl. XXIIIA. figs. 1–3	363
„ *kerguelarum*, Grube,	Pl. XLIV. figs. 9, 10; Pl. XXIIIA. figs. 4–6	364
„ *wyvillei*, n. sp.,	Pl. XLIV. fig. 6; Pl. XXIIIA. figs. 11–14; Pl. XXXVIA. figs. 5–7,	366
Brada, Stimpson,		370
Brada mammillata, Grube,	Pl. XLIII. fig. 11; Pl. XXIIIA. figs. 7, 8	370
„ *whiteavesii*, n. sp.,	Pl. XLV. figs. 3, 4; Pl. XXIIIA. figs. 9, 10	371
Buskiella, n. gen.,		372
Buskiella abyssorum, n. sp.,	Pl. XLV. figs. 1, 2; Pl. XXIIIA. figs. 15–18	372
Family Chætopteridæ,		374
Phyllochætopterus, Grube,		374
Phyllochætopterus claparedii, n. sp.,	Pl. XLV. figs. 9–11; Pl. XLVI. fig. 1; Pl. XXIVA. figs. 1–5,	374
Ranzania, Claparède,		378
Ranzania (?) capensis, n. sp.,	Pl. XXIIIA. figs. 19, 20	378
Spiochætopterus, Sars,		379
Spiochætopterus sp. (?),		379
Family Spionidæ,		380
Scolecolepis, Blainville,		380
Scolecolepis cirrata, Sars, var.,		380
„ „ „ var.,	Pl. XLV. figs. 5, 6; Pl. XXIVA. fig. 6	381
Prionospio, Malmgren,		381
Prionospio capensis, n. sp.,	Pl. XLV. fig. 7; Pl. XXIVA. figs. 7, 8	381
Family Cirratulidæ,		382
Cirratulus, Lamarck,		383
Cirratulus capensis, Schmarda,	Pl. XXIVA. figs. 9, 10	383
„ *zebuensis*, n. sp.,		384
„ *assimilis*, n. sp.,	Pl. XXIVA. figs. 11, 12	384
Chætozone, Malmgren,		385
Chætozone atlantica, n. sp.,	Pl. XLV. fig. 8; Pl. XXIVA. fig. 12	385
„ *benthaliana*, n. sp.,	Pl. XXIVA. figs. 13, 14	386
„ *pacifica*, n. sp.,		387
Family Halelminthidæ,		388
Eunotomastus, n. gen.,		388
Eunotomastus grubei, n. sp.,	Pl. XXIVA. fig. 16	388

		PAGE
Notomastus, Sars,		389
Notomastus agassizii, n. sp.,	Pl. XLVI. fig. 3; Pl. XXIVa. fig. 15	389
„ sp. (Christmas Harbour, Kerguelen),		390
Dasybranchus, Grube,		390
Dasybranchus (*?*) sp.,	Pl. XLV. figs. 13, 14; Pl. XXIVa. fig. 17	390
Family Maldanidæ,		391
Maldane, Grube,		392
Maldane sarsii, Mgrn.,		392
„ *malmgreni*, n. sp.,	Pl. XXVa. fig. 1	393
„ (*?*) sp.,	Pl. XXVa. fig. 9	401
„ (*?*) *atlantica*, n. sp.,	Pl. XXVa. fig. 4	401
Maldanella, n. gen.,		394
Maldanella antarctica, n. sp.,	Pl. XLVII. figs. 1, 2; Pl. XXVa. fig. 11	394
„ *valparaisiensis*, n. sp.,	Pl. XLVI. fig. 12; Pl. XLVII. fig. 3; Pl. XXVa. fig. 12	396
„ *neo-zealaniæ*, n. sp.,	Pl. XLVII. fig. 4; Pl. XXVa. fig. 13	398
Nicomache, Malmgren,		399
Nicomache capensis, n. sp.,	Pl. XLVI. fig. 4; Pl. XXIVa. figs. 18, 19; Pl. XXXVIIa. fig. 2	399
„ *japonica*, n. sp.,	Pl. XLVI. fig. 5; Pl. XXIVa. fig. 20	399
„ (*?*) *benthaliana*, n. sp.,	Pl. XLVI. fig. 8; Pl. XXIVa. fig. 21	400
Praxilla, Malmgren,		402
Praxilla köllikeri, n. sp.,	Pl. XLVI. fig. 6; Pl. XXVa. fig. 2; Pl. XXXVIIa. figs. 3, 8	402
„ *lankesteri*, n. sp.,	Pl. XXVa. fig. 3	403
„ (*?*) *challengeriæ*, n. sp.,	Pl. XXXVa. fig. 5	404
„ *capensis*, n. sp.,	Pl. XXXVa. fig. 8	404
„ *kerguelensis*, n. sp.,	Pl. XLVI. fig. 7; Pl. XXVa. fig. 6	405
„ *assimilis*, n. sp.,	Pl. XLVI. fig. 9; Pl. XXVa. fig. 7	406
„ *occidentalis*, n. sp.,	Pl. XXVa. fig. 10	407
„ (*?*) sp.,	Pl. XXIXa. fig. 15	408
„ *abyssorum*, n. sp.,	Pl. XLVI. figs. 10, 11; Pl. XXXVII. fig. 5; Pl. XXXIXa. figs. 1, 10,	408
Family Ammocharidæ,		410
Myriochele, Malmgren,		410
Myriochele heeri, Mgrn.,	Pl. XXVa. fig. 14, *a*, *b*, *c*	410
„ „ var.,	Pl. XXVIa. fig. 5, *d*	412
„ „ var.,		413
„ *pacifica*, n. sp.,	Pl. XXVa. fig. 15	413
Family Hermellidæ,		414
Sabellaria, Lamarck,		414
Sabellaria (*Pallasia*) *johnstoni*, n. sp.,	Pl. XLVII. figs. 5, 6; Pl. XXVa. figs. 16–23	414
„ „ *capensis*, Schm.,	Pl. XXVa. figs. 24, 25; Pl. XXVIa. figs. 11, 12	418
„ „ *giardi*, n. sp.,	Pl. XLVII. fig. 7; Pl. XXVIa. figs. 13–15	421
Family Amphictenidæ,		422
Petta, Malmgren,		423
Petta assimilis, n. sp.,	Pl. XLVII. figs. 8, 9; Pl. XXVIa. figs. 16–19	423
Family Ampharetidæ,		424
Ampharete, Malmgren,		424
Ampharete sombreriana, n. sp.,	Pl. XXVIa. figs. 20, 21	424
„ *kerguelensis*, n. sp.,	Pl. XLVII. fig. 10; Pl. XXVIa. figs. 22–24	426

		PAGE
Ampharete gracilis, Mgrn.,		426
Phyllocomus, Grube,		427
Phyllocomus croceus, Gr.,	Pl. XLVII. fig. 11; Pl. XXVIA. fig. 25; Pl. XXXVIIA. fig. 6	427
Amphicteis, Grube,		428
Amphicteis gunneri, M. Sars,		428
„ „ „ var. *atlantica*,	Pl. XXVIA. figs. 26–29	429
„ *sarsi*, n. sp.,	Pl. XLVII. fig. 12; Pl. XXVIIA. fig. 1	429
„ *wyvillei*, n. sp.,	Pl. XXVIIA. fig. 2	430
„ *japonica*, n. sp.,	Pl. XXVIIA. figs. 3–5	431
Grubianella, n. gen.,		432
Grubianella antarctica, n. sp.,	Pl. XLVIII. figs. 1, 2; Pl. XXVIIA. fig. 6	432
„ „ var.,	Pl. XXVIIA. fig. 7	434
Samythopsis, n. gen.,		435
Samythopsis grubei, n. sp.,	Pl. XLVIII. fig. 3; Pl. XXVIIA. fig. 8	435
Eusamytha, n. gen.,		436
Eusamytha pacifica, n. sp.,	Pl. XLVIII. fig. 4; Pl. XXVIIA. fig. 9	436
Melinna, Malmgren,		438
Melinna maculata, Webster,	Pl. XXVIIA. figs. 10–12	438
„ *armandi*, n. sp.,	Pl. XLVIII. fig. 5; Pl. XXVIIA. figs. 13, 15	439
„ *pacifica*, n. sp.,	Pl. XLVIII. fig. 6; Pl. XXVIIA. fig. 17	440
Melinnopsis, n. gen.,		441
Melinnopsis atlantica, n. sp.,	Pl. XXVIIA. fig. 18	441
Family TEREBELLIDÆ,		442
Amphitrite, O. F. Müller,		443
Amphitrite kerguelensis, M'I.,	Pl. XLVIII. fig. 7; Pl. XLIX. fig. 1	443
Terebella, Linné,		444
Terebella crassicornis, Schm. (?),	Pl. XXVIIA. fig. 19	444
„ *grubei*, n. sp.,	Pl. XLIX. fig. 2; Pl. XXVIIA. fig. 20	445
„ *kermadecensis*, n. sp.,	Pl. XXVIIA. fig. 21	446
„ (*Lanice*) *flabellum*, Baird,	Pl. XLIX. fig. 3; Pl. L. fig. 1; Pl. XXVIIA. fig. 22	446
„ „ sp.,		448
„ „ *seticornis*, n. sp.,		448
Loimia, Malmgren,		449
Loimia savignyi, n. sp.,	Pl. XXVIIA. fig. 23; Pl. XXXVIIA. fig. 7	449
Schmardanella, n. gen.,		449
Schmardanella pterochæta, Schm.,	Pl. LIII. fig. 1; Pl. XXVIIA. figs. 24–26	449
Pista, Malmgren,		451
Pista sombreriana, n. sp.,	Pl. XXVIIA. fig. 27	451
„ *fasciata*, Gr. (?),	Pl. XLIX. fig. 5; Pl. XXVIIA. fig. 28; Pl. XXXVIIIA. fig. 3	452
„ *abyssicola*, n. sp.,	Pl. XXVIIA. fig. 33; Pl. XXXVIIIA. fig. 1	453
„ *mirabilis*, n. sp.,	Pl. LI. figs. 1, 2; Pl. XXVIIA. fig. 34; Pl. XXXVIIIA. fig. 2	454
„ *corrientis*, n. sp.,	Pl. XLVIII. fig. 11; Pl. XXVIIA. fig. 35	457
Eupista, n. gen.,		458
Eupista darwini, n. sp.,	Pl. L. figs. 2, 3; Pl. XXVIIA. figs. 30–31	458
„ „ var.,	Pl. XXVIIA. fig. 32	459
„ *grubei*, n. sp.,	Pl. XLIX. figs. 6, 7; Pl. XXVIIIA. fig. 1	459
Leæna, Malmgren,		460
Leæna neo-zealaniæ, n. sp.,	Pl. LI. fig. 3; Pl. XXVIIIA. figs. 2, 3	460
„ *abyssorum*, n. sp.,	Pl. XXVIIIA. figs. 8, 9	461

		PAGE
Lœna antarctica, n. sp.,	Pl. XLVIII. figs. 9, 10; Pl. XXVIIIA. fig. 10, 11	462
„ *langerhansi*, n. sp.,	Pl. XXVIIIA. fig. 12	463
Lanassa, Malmgren,		463
Lanassa sarsi, n. sp.,	Pl. XXVIIIA. figs. 4, 5	463
„ *benthaliana*, n. sp.,	Pl. XLVIII. fig. 8; Pl. XXVIIIA. figs. 6, 7	464
Euthelepus, n. gen.,		465
Euthelepus setubalensis, n. sp.,	Pl. L. fig. 4; Pl. XXVIIIA. fig. 13	465
„ *chilensis*, n. sp.,	Pl. LI. figs. 4, 5; Pl. XXVIIIA. figs. 14, 15	467
Thelepus, Leuckart,		469
Thelepus sp. (Torres Strait),	Pl. XXVIIIA. fig. 16	469
„ *cincinnatus*, Fabr.,		469
„ „ var. *canadensis*, nov.,	Pl. XXVIIIA. fig. 17	469
„ sp. (off New York),	Pl. XXVIIIA. fig. 18	470
„ *marenzelleri*, n. sp.,	XXVIIIA. fig. 19	471
Neottis, Malmgren,		472
Neottis antarctica, M'I.,	Pl. LII. fig. 1	472
Ereutho, Malmgren,		474
Ereutho kerguelensis, n. sp.,	Pl. XXVIIIA. figs. 20, 21	474
Polycirrus, Grube,		475
Polycirrus kerguelensis, n. sp.,	Pl. XXVIIIA. fig. 22	475
Ehlersiella, n. gen.,		475
Ehlersiella atlantica, n. sp.,	Pl. XXVIIIA. figs. 26, 27	475
Artacama, Malmgren,		477
Artacama challengeriæ, n. sp.,	Pl. LI. fig. 6; Pl. XXVIIIA. figs. 23, *a*, *b*, 24, 25	477
„ *zebuensis*, n. sp.,	Pl. LI. fig. 7; Pl. XXIXA. figs. 1, 2	478
Terebellides, M. Sars,		480
Terebellides strœmi, M. Sars,	Pl. XXIXA. figs. 3–6	480
„ „ „ var. *kerguelensis*,	Pl. XXIXA. figs. 7, 8; Pl. XXXVIIIA. fig. 4	480
„ (?) sp.,	Pl. XXIXA. figs. 12, 13	481
„ *ehlersi*, n. sp.,	Pl. LI. fig. 8; Pl. XXIXA. figs. 9–11	482
Family SABELLIDÆ,		483
Potamilla, Malmgren,		484
Potamilla torelli, Mgrn.,	Pl. LIII. fig. 2; Pl. XXIXA. figs. 16–19	484
Sabella, Linné,		487
Sabella zebuensis, n. sp.,	Pl. LII. fig. 2; Pl. XXIXA. figs. 20–22	487
„ *assimilis*, n. sp.,	Pl. XXIXA. figs. 23–25	488
„ *bipunctata*, Baird,	Pl. LII. fig. 4; Pl. XXXA. figs. 1–3	489
„ *fusca*, Grube (?),	Pl. LII. fig. 3; Pl. XXXA. figs. 4–6	491
Laonome, Malmgren,		492
Laonome haeckelii, n. sp.,	Pl. XXXA. figs. 7–9	492
Branchiomma, Kölliker,		493
Branchiomma vesiculosum, Mont. (?),	Pl. XXXA. figs. 10–12	493
Dasychone, M. Sars,		495
Dasychone bairdi, n. sp.,	Pl. XXXA. figs. 13–15; Pl. XXXVIIIA. figs. 5, 6; Pl. XXXIXA. figs. 2, 9,	495
„ *picta*, n. sp.,	Pl. XXXA. figs. 16–18; Pl. XXXIXA. fig. 3	497
„ *orientalis*, n. sp.,	Pl. LII. fig. 5; Pl. XXXA. figs. 19–21; Pl. XXXIXA. fig. 4	498
„ *japonica*, n. sp.,	Pl. XXXA. figs. 22–24; Pl. XXXIXA. fig. 5	500
„ *wyvillei*, n. sp.,	Pl. XXXIA. figs. 1–3	501

PAGE

Dasychone nigro-maculata, Baird, Pl. LIII. fig. 5 ; Pl. XXXIa. figs. 4–6 ; Pl. XXXIXa. fig. 6 503
„ *violacea*, Schm., . Pl. LIII. fig. 3 ; Pl. XXXIa. figs. 7, 8 ; Pl. XXXIXa. fig. 7 504
„ *capensis*, n. sp., . Pl. LIV. fig. 1 ; Pl. XXXIa. figs. 9–11 ; Pl. XXXIXa. fig. 8 506

Family Serpulidæ, ... 508
Protula, Risso, ... 509
Protula capensis, n. sp., . . . Pl. LIV. fig. 2 ; Pl. XXXIa. figs. 12, 13 509
„ *lusitanica*, n. sp., ... Pl. XXXIa. fig. 16 511
„ *arafurensis*, n. sp., ... Pl. XXXIa. figs. 17, 18 511
„ *americana*, n. sp., . . . Pl. LIV. fig. 3 ; Pl. XXXIa. figs. 19, 20 512
Apomatus, Philippi, ... 514
Apomatus elisabethæ, n. sp., . . . Pl. LIV. fig. 4 ; Pl. XXXIa. figs. 21, 22 514
Serpula, Linné, ... 515
Serpula sombreriana, n. sp., ... Pl. XXXIa. figs. 14, 15 515
„ *narconensis*, Baird, . . Pl. LIV. fig. 5 ; Pl. LV. fig. 1 ; Pl. XXXIa. fig. 23 516
„ „ var. *magellanica*, nov., . Pl. LV. fig. 2 ; Pl. XXXIa. figs. 24, 25 518
„ *philippensis*, n. sp., . . . Pl. LIV. fig. 7 ; Pl. XXIXa. fig. 28 519
„ *vermicularis*, L., ... 520
„ , tubes of, ... 530, 531
Pomatocerus, Philippi, ... 520
Pomatocerus strigiceps, Mörch, . . Pl. LV. figs. 3, 4 ; Pl. XXXIa. figs. 26–28 520
Placostegus, Philippi, ... 522
Placostegus ornatus, Sowerby, . . Pl. LV. figs. 5, 6 ; Pl. XXXa. figs. 25, 26 522
„ *benthalianus*, n. sp., . . . LV. fig. 7 ; Pl. XXXa. fig. 28 524
„ *mörchii*, n. sp., . . . Pl. LV. fig. 8 ; Pl. XXXa. figs. 29, 30 524
„ *assimilis*, n. sp., . . . Pl. LV. fig. 9 ; Pl. XXIXa. figs. 29, 30 525
„ *tridentatus*, O. Fabr., ... 527
Hydroides, Gunner, ... 527
Hydroides multispinosa, Marenz., . Pl. XXIXa. figs. 26, 27 ; Pl. XXXIXa. fig. 12 527
„ *norvegica*, Gunner, ... 528
Vermilia, Lamarck, ... 528
Vermilia sp. (?) (Patagonia), ... Pl. XXXa. figs. 31, 32 528
Spirobranchus, Blainville, ... 529
Spirobranchus occidentalis, n. sp., . . Pl. LV. fig. 10; Pl. XXIXa. figs. 31, 32 529
Spirorbis, Daudin, ... 530
Spirorbis sp. (?), ... 530
Ditrypa, Berkeley, ... 531
Ditrypa arietina, O. F. M., ... Pl. LIV. fig. 6 531

Family Tomopteridæ, ... 531
Tomopteris, Eschscholtz, ... 531
Tomopteris carpenteri, De Quatref., ... 531
„ *onisciformis*, Esch., ... 532

Crustacean Parasites.

Leanicola rotundata, n. gen. et sp., on *Leanira areolata*, n. sp., ... 153
Trophoniphila bradii, n. sp., on *Trophonia wyvillei*, n. sp., ... 368
Praxillinicola kröyeri, n. gen. et sp., on *Praxilla abyssorum*, n. sp., . . Pl. XXXIXa. fig. 10 409
Œstrella levinseni, n. gen. et sp., on *Ehlersiella atlantica*, n. sp., . . Pl. XXXIXa. fig. 11 477

INDEX.

Synonyms and Species incidentally mentioned are in *italics*, and where several pages are indicated that having the bolder type is most important.

Achloë astericola, 57, 76, 127.
Acineta, 98.
Acœtidæ, 135.
Acrocirrus, 383.
Agassiz, Prof. Alex., 389, &c.
Alciopa, 177.
antarctica, 175.
atlantica, 173.
candida, 173.
lepidota, 173.
pacifica, 174.
quadrioculata, 176.
reynaudii, 173.
Alciopidæ, 173.
Alciopina parasitica, 174.
"Alert," cruise of, 326.
Alitta, 223.
Allman, Prof., 102.
Allmaniella setubalensis, 102.
Amage, 432, 433.
Ammocharidæ, 410.
Ammotrypane *aulogaster*, 357.
gracile, 357.
Ampharete *arctica*, 425.
gœsi, 425.
gracilis, 425, 426.
kerguelensis, 426.
patagonica, 424, 426.
sombreriana, 424.
Ampharetidæ, 424.
Amphicteis *acutifrons*, 434.
gunneri, 424, 430, 431.
gunneri, var., 429.
japonica, 431.
philippinarum, 428.
sarsi, 429.
Amphicteis wyvillei, 430.
(*Sabellides*) *angustifolia*, 428, 432.
Amphictenidæ, 422.
Amphinomidæ, 6.
Amphinome *bruguieresi*, 29.
gigas, 27.
didymobranchiata, 27
rostrata, 21.
vagans, 8, 21.
Amphitrite *cirrata*, 443.
kerguelensis, 443.
ornata, 128.
vigintipes, 444.
Anderson, Dr. John, xxv.
Annelids, general condition of Challenger, vii.
methods in description, viii.
classification, viii.
species, ix.
food, ix.
tubes, x.
General remarks on, x.
Geographical and bathymetrical distribution, xiii.
Antinoe pulchella, 73.
sarsi, 58.
Anisoceras, 231, 233.
Aphrodita *alta*, 37.
australis, 34, 421.
aculeata, 34, 495.
echidna, 36.
intermedia, 38.
longicornis, 37.
squamata, 67.
Aphroditidæ, 33.
Apomatus *ampulliferus*, 515.
elisabethæ, 514

Apomatus *globifer*, 515.
similis, 515.
Arabella, 236, 238.
Aracoda, 340.
Arenia, 390.
Arestenia conspurcta, 7.
Aricia norvegica, 352.
platycephala, 353.
Aricidea fragilis, 354.
Ariciidæ, 352.
Artacama challengeriæ, 477.
proboscidea, 477.
zebuensis, 478.
Asterope, 174.
candida, 176.
Autolytus *cornutus*, 204.
prolifer, 204.
macleavanus, 207.
Balfour, Prof. John Hutton, 301.
Bathymetrical distribution, xiii, xxx.
Beechy, Capt., voyage, v.
Belcher, Sir E., voyage, v, vi.
Bell, Prof. Jeffrey, xi.
Bhawania, 55.
myrialepis, 116.
"Blake," U.S. ship, vii.
"Bonite, La," voyage, v.
Bourne, A. G., B.Sc., 57.
Brada mammillata, 370.
whiteavesii, 371.
Brady, Prof. G. S., 368.
Branchiomma vesiculosum, 493.
vigilans, 495.
Bylgia, 103.
Busk, Prof. G., xiii, 372.
Buskiella abyssorum, 372.
Callizona, 174.
Capitella, 388.
capitata, 389.
Carpenter, Dr. B. W., vii.
Ceratonereis mirabilis, 231.
vulgata, 231.
Chætogaster, 205.
vermicularis, 203.
Chætopteridæ, 374.
Chætopterus, 377.
insignis, 128.
Chætozone atlantica, 385.
benthaliana, 386.
pacifica, 387.
Chætozone *setosa*, 385.
Chamisso and Eysenhardt, voyage, iv.
Chloræmidæ, 362.
Chloeia bengalensis, 15.
capillata, 8.
ceylonica, 9.
flava, 8.
fusca, 14.
incerta, 9.
macleayi, 15.
malaica, 15.
parva, 15.
pulchella, 9.
rupestris, 8.
tumida, 13.
Chloenea atlantica, 15.
Chrysopetalum, 116.
fragile, 55.
Chrysothemis, 396.
Cirratulidæ, 382.
Cirratulus assimilis, 384.
borealis, 385.
capensis, 383.
cirratus, 383.
zebuensis, 384.
Claparède, Edouard R., vii *et passim*.
Clymene grossa, 397.
koreni, 393.
Cobbold, Dr., ii.
Corymorpha, vii.
Crustacean parasites, iii, 153, 368, 409, 477.
Cystenides hyperborea, 423.
Dalhousia, 186.
atlantica, ii, 186.
Dalhousie, the Earl of, 186.
Dasybranchus (fragment), 390.
caducus, 391.
Darwin, Charles, v, 90.
Dasychone bairdi, 495.
cingulata, 498.
dalyelli, 501.
capensis, 506.
japonica, 500.
luctuosa, 500.
nigro-maculata, 503.
orientalis, 498.
picta, 497.
polyzonos, 507.
serratibranchis, 498.
violacea, 504.

Dasychone wyvillei, 501.
Dasylepis asperrima, 78.
equitis, 77.
Diopatra, 304.
Diplobranchus, 162.
Distribution, Geographical, xiii.
Ditrypa arietina, 531.
Dodecaceria, 383.
Drilonereis, 238, 340.
Echinoderes dujardinii, 472.
Ehlers, Prof. Ernst, vii *et ubique*.
Ehlersiella atlantica, 475.
Elliot, Sir Walter, xxv.
Œrsted, A. S., 5 *et ubique*.
Eone *nordmanni*, 341.
trifida, 341.
Ereutho kerguelensis, 474.
smitti, 474.
Eschscholtz, voyage, iv.
Eteone, ii.
Eulagisca corrientis, 91, 112.
remarkable parasite of, 93.
Eulalia capensis, 168.
gracilis, 204.
viridis, 168.
Eulepis challengeriæ, 134.
hamata, 133.
wyvillei, 131.
Eumenia *longisetosa*, 360.
reticulata, 360.
Eumolphe fragilis, 56.
Eunice sp. (?), 299.
branched tube of, 267.
aphroditois, 282.
australis, 272.
barvicensis, 292.
bassensis, 276, 298.
bellii, 304.
capensis, 294.
cirrobranchiata, 277.
edwardsi, 280.
elseyi, 286.
equibranchiata, 291, 297.
filamentosa, 300.
frauenfeldi, 270.
indica, 272.
kobiensis, 278.
limosa, 276.
machrochæta, 294.
madeirensis, 302.
Eunice magellanica, 265.
(young), 267.
microprion, 280.
mindanavensis, 289.
murrayi, 288.
norvegica, 273 *et seq.*
œrstedi, 273.
paupera, 301.
prognatha, 268.
pycnobranchiata, 294, 298.
quoya, 298.
siciliensis, 261.
stragulum, 304.
torquata, 285.
torresiensis, 67, 270.
tribranchiata, 297.
vittata, 275.
Eunicidæ, 261.
Eunoa abyssorum, 73.
ampullifera, 74.
capensis, 72.
hispanica, 72.
iphionoides, 69.
mindanavensis, 74.
œrstedi, 70.
opalina, 71.
yedoensis, 75.
Eunotomastus grubei, 388.
Euphione elisabethæ, 62.
Eupholoë, 157.
philippensis, 157.
Euphrosyne borealis, 5.
capensis, 1.
foliosa, 2, 3, 4, 5.
Euphrosynidæ, 1.
Eupista darwini, 458, 460.
var., 459.
grubei, 459.
Euplectella, 109, 205.
Eupolynoë mollis, 101.
chilensis, 467.
setubalensis, 465.
Eupompe australiensis, 135.
Eurythoë, 384.
borealis, 6.
complanata, 29.
pacifica, 27.
var. levukaensis, 29.
Eusamytha pacifica, 436.
Eusyllis *assimilis*, 196.

Eusyllis kerguelensis, 191.
kupfferi, 192.
tubifex, 190, 198.
Evarne impar, 58, 97.
johnstoni, 99.
kerguelensis, 97.
tenuisetis, 99.
Eysenhardt, *see* Chamisso.
Exogone, 81.
gemmifera, 204.
heterosetosa, 205.
naidina, 204.
Fallacia sicula, 185.
"Favourite, La," voyage of, v.
Filigrana, 204.
Fisurella cratitia, 128.
Flabelligera, 373.
Flower, Prof., xi.
"Fly," H.M.S., voyage, v.
Forbes, Prof. Ed., Zoology, H.M.S. "Herald," vi.
Freycinet, voyage, iv.
Frey, *see* Leuckart.
Gastrolepidia clavigera, 57.
"Gazelle," German ship, vii.
Genetyllis oculata, 169.
Geographical distribution, xiii.
Gephyrea, iii.
Glycera amboinensis, 345.
brevicirrus, 346.
capitata, 342, 343.
decipiens, 345.
kerguelensis, 344.
lamelliformis, 347.
mertensii, 348.
rutilans, 345.
sagittariæ, 346.
saccibranchis, 346.
subœnea, 347.
tessellata, 343.
Glyceridæ, 342.
Goniada maculata, 341.
Goniadidæ, 341.
Gray, Dr. J. E., iv.
Greeff, Prof. R., 171, 180, 181, 204.
Greeffia (Nauphanta) oahuensis, 182.
Gregarinæ, 168.
Grube, Prof. A. E., v, *et passim*.
Grubianella antarctica, 432.
var., 434.
Gunn, Dr. R. Marcus, x, 170, 178.
Gyptis, 189.
Halelminthidæ, 388.
Halodora, 174, 178.
reynaudii, 178, 183.
Halosydna fragilis, 128.
gelatinosa, 102.
lordi, 128.
Hansen, Dr., vii., &c.
Harmothoë benthaliana, 95.
haliaëti, 96.
imbricata, 58, 95, 128.
malmgreni, 128.
marphysæ, 112.
Haswell, W., M.A., B.Sc., 20, 57, 529.
Hemipodus magellanicus, 349.
patagonicus, 351.
Hermadion *ferox*, 108.
fragile, 104.
fuligineum, 101.
kerguelensis, 105.
longicirratus, 83, 108.
magalhœnsi, 77, 104, 108.
pellucidum, 124.
Hermellidæ, 414.
Hermione *chrysocoma*, 39, 108.
hystrix, 33, 39.
Hermodice caruneulata, 24.
Hesione *intertexta*, 185.
pacifica, 184.
pantherina, 185.
splendida, 185.
fragment, 186.
Hesionidæ, 183.
Hipponoë *cranchii*, 31.
gaudichaudi, 30.
Hooker, Sir Joseph, v.
Hoyle, W. E., xi.
Hubrecht, Prof., iii.
Huxley, Prof., vi, xxvii, 204.
Hyalea, 472.
Hyalinœcia benthaliana, 339.
bilineata, 340.
camiguina, 338.
platybranchis, 338.
tubicola, 307, 335.
var., 336.
var. longibranchiata, 337.
var. papuensis, 339.
Hyalonema, 313.
Hydroides multispinosa, 527.

Hydroides *norvegica*, 527, **528**.
Hydrophanes, ii.
Infusoria, 98.
Iphione glabra, 60.
fimbriata, 60.
muricata, 58, 59, 60, 61.
ovata, 60.
spinosa, 61.
Iphionella cimex, 58.
Jeffreys, Dr. Gwyn, i, 359, &c.
Johnston, Dr. George, 414.
Kronia angelini, 174.
auroræ, 174.
Kinberg, J. G. H., vi *et passim*.
King, Capt., voyage, iv.
"Knight Errant," H.M.S., vii.
Kröyer, H., vi.
Lænilla *alba*, 58.
fusca, 100.
glabra, 58.
mollis, 58, 94.
Lætmonice aphroditoides, 51.
filicornis, 39.
japonica, 50.
producta, **39**, 97.
var. assimilis, 49.
var. benthaliana, 45.
var. willemoesi, 47.
var. wyvillei, 44.
violascens, 51.
Lagisca antarctica, 80, 205.
crosetensis, 88.
darwini, 90.
hexactinellidæ, 94.
jeffreysii, 79, 86.
kermadecensis, 93.
magellanica, 82.
var. grubei, 84.
var. murrayi, 83.
(Agnodice) moseleyi, 87.
peracuta, 85.
propinqua, 58, **78**, 86.
rarispina, 79.
tenuisetis, 78.
yokohamiensis, 89.
Langerhans, Prof., 204 *et passim*.
Lankester, Prof. Ray, iii, 203, 351, 403, 407.
Lanassa benthaliana, 464.
nordenskioldi, 464.
sarsi, 463.
Lanice conchilega, 447.
Laonome haeckelii, 492.
japonica, 493.
kröyeri, 493.
salmacidis, 493.
Laranda longa, 237.
Leæna abyssorum, 461.
antarctica, 462.
graffii, 461.
langerhansi, 463.
neo-zealaniæ, 460.
Leanira areolata, 151.
hystricis, 153, **155**.
japonica, 154.
lævis, 156.
magellanica, 150, 152.
quatrefagesi, 155.
tetragona, 151.
Leaniricola rotundata (Crustacean parasite), 153.
Leiocapa vertebralis, 173.
vitrea, 173.
Lepas anatifera, 205.
Lepidametria commensalis, 128.
Lepidasthenia, 73, 113.
Lepidonotus *clava*, 57, 116.
cristatus, 67.
cæruleus, 65.
dictyolepis, 61.
gymnonotus, 64.
melanogrammus, 130.
oculatus, 116.
squamatus, 60, 64, 112.
stellatus, 114.
simplicipes, 131.
striatus, 113.
wahlbergi, 66.
Leuckart, F., iv.
Leuckart, Frey and, 204.
Lithognatha worslei, 262.
Loimia *medusæ*, 449.
savignyi, 449.
Loxosoma, 85.
Lumbriconereis abyssorum, 250.
atlantica, 251.
bifurcata, 241.
brasiliensis, 251.
cavifrons, 241.
chilensis, 243.
ehlersii, 253.
var. *tenuisetis*, 253.

Lumbriconereis *fragilis*, 235 *et seq.*
heterochæta, 251.
heteropoda, 243, **255**.
jacksoni, 243.
japonica, 243.
johnstoni, 245.
kerguelensis, 246.
magalhaënsis, 247.
nardonis, 246.
neo-zealaniæ, 248.
opalina, 253.
pettigrewi, 239.
punctata, 252.
sphærocephalus, 250.
tetraurus, 241.
Lumbrinereidæ, 235.
Lygdamis indicus, 422.
Macduff, Alex., 303.
Macduffia bonhardi, 303.
Macellicephala (Polynoë) mirabilis, 110, 121.
Maldane atlantica, 401.
malmgreni, 393.
sarsi, 392.
tenuis, 394.
(?) sp., 401.
Maldanella antarctica, 392, **394**, 397, 408.
valparaisiensis, 392, **396**.
neo-zealaniæ, 392, **398**.
Maldanidæ, 391.
Marphysa, 282.
goodsiri, 299.
sanguinea, 300.
Melinna armandi, 439.
cristata, 439, 440, 441.
maculata, 438.
pacifica, 440.
Melinnopsis atlantica, 441.
Microstomum, 203.
Milne-Edwards, Prof. H., 280.
Monteith, James, xi.
Moseley, Prof., 202.
Müller, O. F., 203 *et passim*.
Murie, Dr., xi.
Murray, Mr John, i, iii, 288, &c.
Myrianida, 203.
Myriochele *danielsseni*, 413.
heeri, ii, 410.
var., 412.
heeri, var. (2), 413.
pacifica, 413.
Myriochele *sarsii*, 411.
Nais proboscidea, 203.
Najades (*Alciopa*) *cantrainii*, 173.
Nares, Sir George, vii.
Nauphanta, 174, 177, 182.
celox, 182.
Nausicaa, 304.
Nectonereis megalops, 209.
Nematoids, ii, 160.
Nematonereis schmardæ, 262.
unicornis, 264.
sp., 264.
Nemerteans, iii, iv.
Neottis antarctica, 472.
Nephthydidæ, 159.
Nephthys *atlantica*, 163.
ciliata, 162.
cæca, 160, 161.
dibranchis, **161**, 163.
jeffreysii, 162.
malmgreni, 165.
minuta, 163.
modesta, 165.
phyllobranchia, 164.
picta, 133.
trissophyllus, 159.
verrilli, 163.
Nereidæ, 208.
Nereilepas, 209, 223.
Nereis *abyssicola*, 231.
agassizi, 211.
antillensis, 224.
(Platynereis) arafurensis, 214.
atlantica, 219.
(Ceratonereis) brasiliensis, 230.
cultrifera, 209, 217, 221.
diversicolor, 209, 212.
dumerilii, 209, 210, 211, 213, **221**, 224, 225.
(Platynereis) eatoni, 223.
floridana, 221.
(*Platynereis*) *fusco-rubida*, 216.
heteropoda, iv.
hircinicola, 210.
jucunda, 215.
kerguelensis, **225**, 231.
(Platynereis) kobiensis, **210**, 224, 225.
limbata, 219.
longisetis, 222.
longissima, 209.
magellanica, 229.

Nereis *marionii*, 216, 218.
(*Lycoris*) *masalacensis*, 227.
(Perinereis) melanocephala, 216.
patagonica, 228.
pelagica, 209, 216, 226, 227, 262.
(*Ceratonereis*) *similisetis*, 223.
succinea, 219.
(Platynereis) tongatabuensis, 212.
vexillosa, 219.
Nerine foliosa, 380.
Nicidon balfouriana, 301.
Nicolea, 450.
Nicomache benthaliana, 391, 400.
capensis, 399.
japonica, 399.
lumbricalis, 399, 400.
Nordenskiöld, Prof., N. Atlantic voyage, vii.
Norman, Rev. Dr. Merle, 333.
Nothria abranchiata (= abyssicola), 314, 318, 319.
armandi, 330.
conchylega, 305 *et seq.*
ehlersi, 327, 330, 331.
hyperborea, 317.
macrobranchiata, 320.
minuta, 334.
pycnobranchiata, 317.
quadricuspis, 332.
sombreriana, 310.
var., 313.
tenuisetis, 307.
willemoesii, 322, 329.
brevicirris, 339.
Notocirrus capensis, 236.
chilensis, 237.
scoticus, 238.
tricolor, 236, 237.
Notomastus agassizii, 389.
filiformis, 390.
luridus, 390.
sarsii, 390.
(?) sp., 390.
Notopygos *crinitus*, 18.
labiatus, 19.
maculata, 21.
megalops, 17.
Nychia, 77.
cirrosa, 108, 128.
Odontosyllis hyalina, 190.
Œorpata armata, 439.
Œrsted, A. S., vi. *et ubique*.
Œstrella levinseni (Crustacean parasite), 477.
Onuphididæ, 304.
Onuphis, 304, 305.
fragilis, 313.
holobranchiata, 322.
intermedia, 339.
setosa, 313, 335.
Opheliidæ, 357.
Ophiodromus, 189.
Otanes, 434.
Owenia, 410.
Pagenstecher, Prof. Alex., 204.
Palæonotus, 55.
Palmyra aurifera, 53.
Palmyridæ, 53.
Palolo viridis, 257.
Panthalis œrstedi, 138.
Parry, Capt., voyage, iv.
Pedicellaria, 296.
Perinereis, 221.
gallapagensis, 214.
formosa, 214.
hedenborgi, 221.
Pérouse, La, voyage, iv.
Petta assimilis, 423.
pusilla, 423.
Pettigrew, Prof., 239.
Phenacia, 467.
Phipps, Capt., voyage, iii.
Pholoë brevicornis, 124.
minuta, 158.
Phyllochætopterus claparedii, 374.
socialis, 376.
Phyllocomus croceus, 427.
Phyllodoce *groenlandica*, 170.
duplex, 167.
(Anaitis?) madeirensis, 167.
sancti-vincentis, 166.
Phyllodocidæ, 165.
Piromis arenosus, 364.
Pista abyssicola, 453.
corrientis, 457.
cristata, 451 *et seq.*
fasciata, 452.
intermedia, 458.
maculata, 453.
mirabilis, 454.
sombreriana, 451.
Placostegus assimilis, 525.
benthalianus, 524.

Placostegus mörchii, 524.
ornatus, 522.
tridentatus, 525, 526, **527**.
tricuspidatus, 523.
Platynereis, 210, 212, 214.
Pleurobrachia densa, 205.
Polycirrus, 204.
aurantiacus, 475.
hæmatodes, 475.
kerguelensis, 475.
nervosus, 475.
Polydora, 378, 380.
Polyeunoa lævis, 76.
Polymnia congruens, 446.
Polynoë *antarctica*, 82.
ascidioides, 109.
asterolepis, 125, 131.
attenuata, 120.
australis, 113.
capensis, 114.
(Langerhansia) euplectellæ, 108.
foraminifera, 57.
fullo, 83.
fulvovittata, 113.
(Lepidonotus) iphionoides, 116.
islandica, 70.
lamellifera, 90.
longicirra, 104.
(Admetella) longipedata, 124.
longisetis, 128.
macrolepidota, 70.
magnipalpa, 58, 118.
(Makellicephala) mirabilis, 121.
ocellata, **126**, 376.
ochthæbolepis, 131.
platycirrus, **111**, 113, 232.
pellucida, 104.
peronea, 61.
pustulata, 115.
rutilans, 128.
scolopendrina, 76, 108, 120, 121.
(Robertianella) synophthalma, 122.
tenuisetis, 79.
trochiscophora, 67, 73.
vesiculosa, 81.
vittata, 128.
zonata, 79.
Polynoella levisetosa, 128.
Pomatocerus *bowerbankii*, 522.
cariniferus, 522.
Pomatocerus *multicornis*, 522.
sanguinea, 522.
strigiceps, 520.
triqueter, 520.
Pontogenia, 53.
Potamilla *malmgreni*, 486.
oculifera, 486.
torelli, 484.
reniformis, 486.
tortuosa, 486.
Praxilla abyssorum, 408.
arctica, 408.
assimilis, 406.
capensis, 404.
challengeriæ, 404.
collaris, 403.
gracilis, 408.
kerguelensis, **405**, 407.
köllikeri, **402**, 406.
lankesteri, **403**, 407.
occidentalis, 407.
prætermissa, 402, 405.
sp., 408.
Praxillinicola kröyeri (Crustacean parasite), 409.
Prince, Ed. E., x.
Prionognathus, 232.
kefersteini, 234.
Prionospio capensis, 381.
steenstrupi, 382.
Proceræa picta, 204.
Protula americana, 512.
appendiculata, 514.
arafurensis, 511.
arctica, 511.
capensis, 509.
cæcus, 511.
lusitanica, ii, 511.
multicostatus, 511.
protensa, 510.
Pseudonereis, 214.
Psammolyce *albicans*, 147.
arenosa, 147.
fijiensis, 148.
herminiæ, 147.
occidentalis (= sombreriana), 146.
petersi, 147.
rigida, 147.
sombreriana = occidentalis, 149.
umbonifera, 147, 149.
Psamocollus, 410.

Quatrefages, Prof. A. de, 7 *et ubique.*
Ranzania capensis, 378.
sagittaria, 379.
Regions, xiv.
Region A. North Atlantic, xiv.
B. South Atlantic, xvii.
C. South Indian or Kerguelen, xx.
D. Australian, xxii.
E. Philippine or Japanese, xxv.
F. North Pacific, xxvii.
G. South Pacific, xxviii.
Rhodine lovéni, 409.
Rhodinicola elongata (Crustacean parasite), 409.
Rhynchonerella, 173, 174.
Ross, Sir James, voyage, v.
Ross, Sir John, voyage, iv.
Rüppel, Atlas, p. iv.
Sabella *acrophthalmos*, 495.
assimilis, 488.
bipunctata, 489.
fusca, 491.
frustulosa, iii.
fusco-tænia, 493.
occidentalis, 489.
pavonina, 483 *et seq.*
saxicava, 486.
zebuensis, 487.
Sabellaria (Pallasia) *giardi*, 421.
capensis, 418, 421.
johnstoni, 414, 419, 421.
lævispinis, 422.
sexhamata, 418.
saxicava, 414, 418.
Sabellidæ, 483.
Sabine, Capt. Sir Ed., iv.
Sagitta, vi.
St. John, Capt., vii.
Salpingœca, 67.
Salvatoria, 188.
kerguelensis, 188.
Samarang, H.M.S., voyage, v.
Samytha, 435.
Samythella, 436.
Samythopsis grubei, 435.
Sars, Prof. M., 392 *et passim.*
Scalibregma inflatum, 359.
Scalibregmidæ, 359.
Scalisetosus ceramensis, 103.
Schmarda, Prof. L., vi *et passim.*
Schmardanella pterochæta, 449.
Schmidt, Prof. Oscar, 204.
Scionopsis, 451.
Scolecolepis cirrata, 380.
var., 380.
var., 381.
Scoloplos, 353, 355.
armiger, 355, 356.
kerguelensis, 355.
Serpula *crater*, 517.
jukesii, 518.
narconensis, 516.
var. magellanica, 518.
patagonica, 516, 518.
philippensis, 519.
sombreriana, 515.
triquetra, iii.
uncinata, 517.
vasifera, 518.
vermicularis, 516, 520.
Serpulidæ, 508.
Sigalion *arenicola*, 146.
buskii, 145.
edwardsii, 146.
Sigalionidæ, 139.
Slabber, Martin, 204.
Sonnerat, M., voyage, iii.
Sphærosyllis, 189.
Spiochætopterus sp., 379.
typicus, 374.
Spionidæ, 380.
Spirobranchus (*Cymospira*) *decumbens*, 530.
brachycera, 530.
giganteus, 508, 530.
occidentalis, 529.
Spirographis australiensis, 492.
Spirorbis sp. (?), 530.
Staurocephalidæ, 231.
Staurocephalus atlanticus, 233.
australiensis, 232.
ciliatus, 234, 235.
lovéni, 233.
rudolphii, 234.
rubrovittatus, 234.
Stenostomum, 203.
Sternaspis, iii.
Stimpson, W., voyage, vi.
Studer, T., 371.
Stylaria, 205.
Stylarioides parmatus, 370.
Syllidæ, 189.

Sphærosyllis kerguelensis, 206.
Surface forms, xiii.
Syllides pulligera, 206.
Syllis *armillaris*, 193.
brasiliensis, 196.
capensis, 193.
flaccida, 203.
gigantea, 193.
gracilis, 196, 197.
lychochætus, 203.
prolifera, 203.
ramosa, 198.
robertianæ, 197.
setubalensis, 195.
spongicola, 196.
vancaurica, 196.
Telepsavus costarum, 378.
Terebella *atricapilla*, 451.
bipunctata, 473.
crassicornis, 444.
flabellum, 446.
grubei, 445.
kerguelensis, 473.
kermadecensis, 446.
meckelii, 450.
nesidensis (*danielsseni*, Mgrn.), 445.
(Lanice) seticornis, 448.
(?) sp., 448.
Terebellidæ, 442.
Terebellides ehlersi, 482.
pacifica, 483.
sieboldii, 482.
strœmi, 480.
var. *kerguelensis*, 480.
ypsilon, 483.
sp. (?), 481.
Thalenessa, 139.
fimbriata, 144.
digitata, 140.
Thalenessa oculata, 142.
Théel, Dr. Hj., 361, &c.
Thelepus sp., 469, 470.
antarcticus, 473.
cincinnatus, 469.
var. canadensis, 469.
goodsiri, 471.
japonicus, 472.
marenzelleri, 471.
triserialis, 471.
Thomson, Prof. Sir Wyville, i.
Tomopteris carpenteri, 531.
onisciformis, iv, 531.
Tradopia maculata, 309.
Travisia *forbesii*, 358.
glandulosa, 358.
kerguelensis, 357.
Triton, H.M.S., vii.
Trophonia capensis, 363.
glauca, 362.
kerguelarum, 364.
plumosa, 363.
wyvillei, ii, 366.
Trophoniphila bradii, n. sp. (Crustacean parasite), 368.
Tuckey, Capt., voyage, iv.
Typosyllis, 193.
variegata, 205.
United States Exploring Expedition, v.
Vaillant, L., 204.
"Valorous," voyage of, vii.
Vanadis, 174.
Vermilia (?) sp., 528.
Voyage en Scandinavie, &c., iv.
Wilkes, C., *vide* United States Exploring Expedition.
Willemoes-Suhm, Dr. Rudolf, i, ii, &c.
Wilson, John, x.
Zophyrus loveni, 519.
Zygolobus (*Lumbriconereis*), 255.

PLATE I.

PLATE I.

Fig. 1. Ventral view of *Notopygos megalops*, ... Enlarged.

Fig. 2. *Euphrosyne borealis*. Dorsal view, and from position the caruncle is imperfectly shown, ... Enlarged.

Fig. 3. Ventral view of the same species, ... Similarly enlarged.

Fig. 4. Ventral aspect of *Chloenea atlantica*, . . . No. 5 Enlarged.

Fig. 5. Dorsal view of *Hipponoë gaudichaudi*, ... Enlarged.

Fig. 6. Dorsal surface of *Aphrodita intermedia*, ... Enlarged.

Fig. 7. Tail and dorsal anus of *Amphinome rostrata*, . . Slightly enlarged.

EUPHROSYNIDÆ, AMPHINOMIDÆ &c.

PLATE II.

PLATE II.

Fig. 1. *Chloeia fusca.* Dorsal view, ... Enlarged.

Fig. 2. Ventral view of the same.

Fig. 3. Anterior end of *Eurythoë pacifica,* . . . . . Enlarged.

Fig. 4. Ventral view of the same, ... Enlarged.

Fig. 5. Dorsal view of *Euphrosyne capensis,* . . . . . Enlarged.

Fig. 6. Lateral view of *Notopygos labiatus,* . . . . . Enlarged.

Fig. 7. Anterior extremity of *Lagisca tenuisetis.* The tentacle is probably in process of regeneration, ... Enlarged.

PLATE III.

PLATE III.

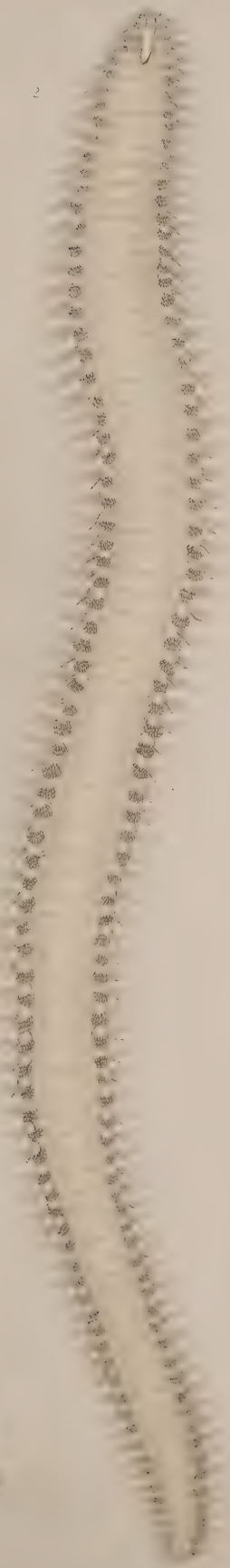
Fig. 1. *Chloeia flava.* Dorsal view, ... Enlarged.

Fig. 2. *Eurythoe pacifica.* Dorsal view, ... Enlarged.

Fig. 3. Ventral view of *Chloeia flava,* . . . . . Enlarged.

Fig. 4. Anterior end of *Polynoë platycirrus,* . . . . . Enlarged.

Fig. 5. Anterior extremity of *Lagisca magellanica,* var. *grubei,* . . Enlarged.



AMPHINOMIDÆ & POLYNOIDÆ

PLATE IV.

PLATE IV.

Fig. 1. *Amphinome rostrata*, ... Slightly enlarged.

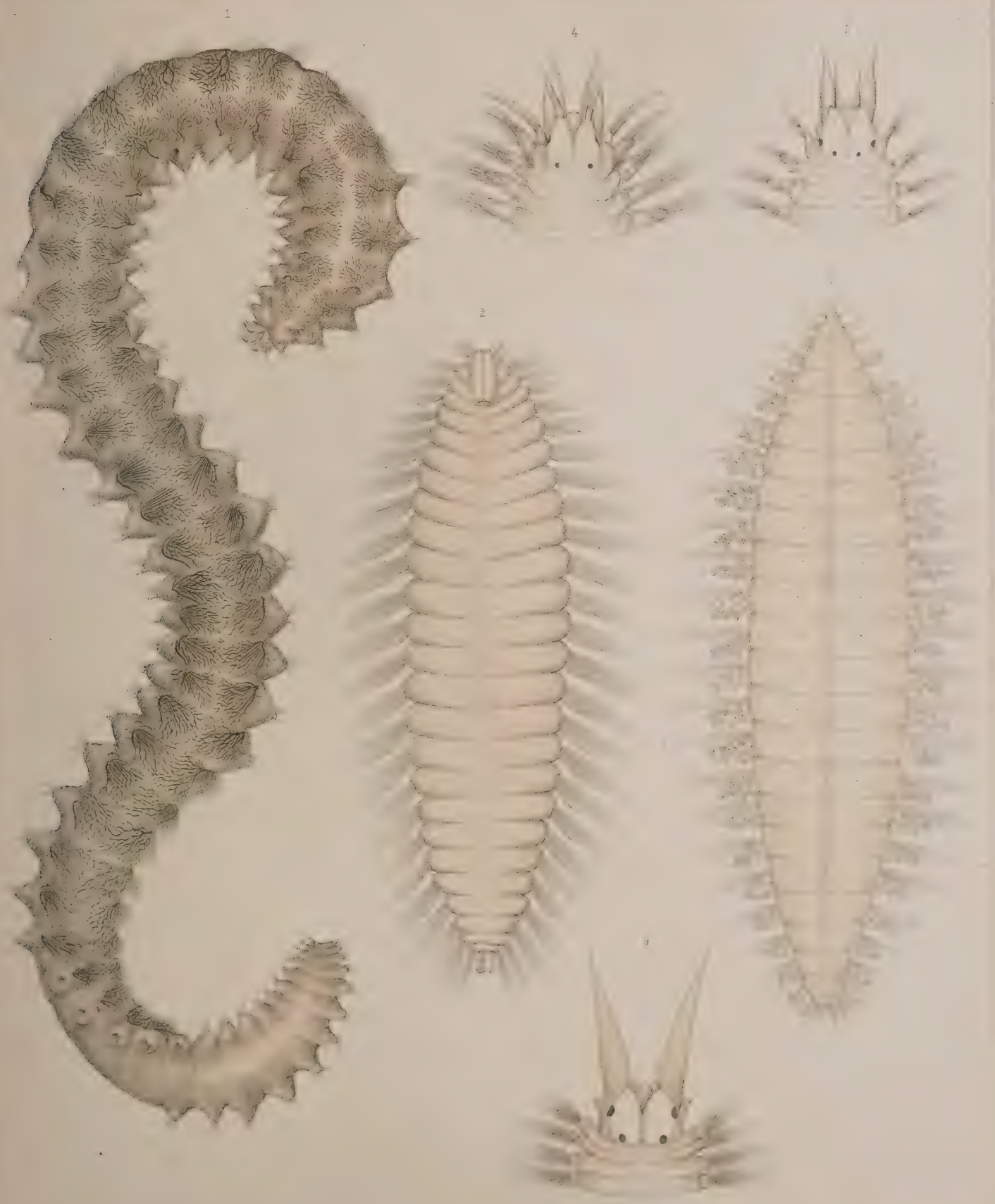
Fig. 2. Ventral view of *Notopygos labiatus*, ... Enlarged.

Fig. 3. Ventral view of *Hipponoë gaudichaudi*, ... Enlarged.

Fig. 4. Anterior extremity of *Polynoë capensis*, ... Enlarged.

Fig. 5. Anterior end of *Lagisca hexactinellidæ*, ... Enlarged.

Fig. 6. Anterior end of *Lagisca peracuta*, ... Enlarged.



AMPHINOMIDÆ & POLYNOIDÆ

PLATE V.

PLATE V.

Hermodice carunculata, ... Slightly enlarged.

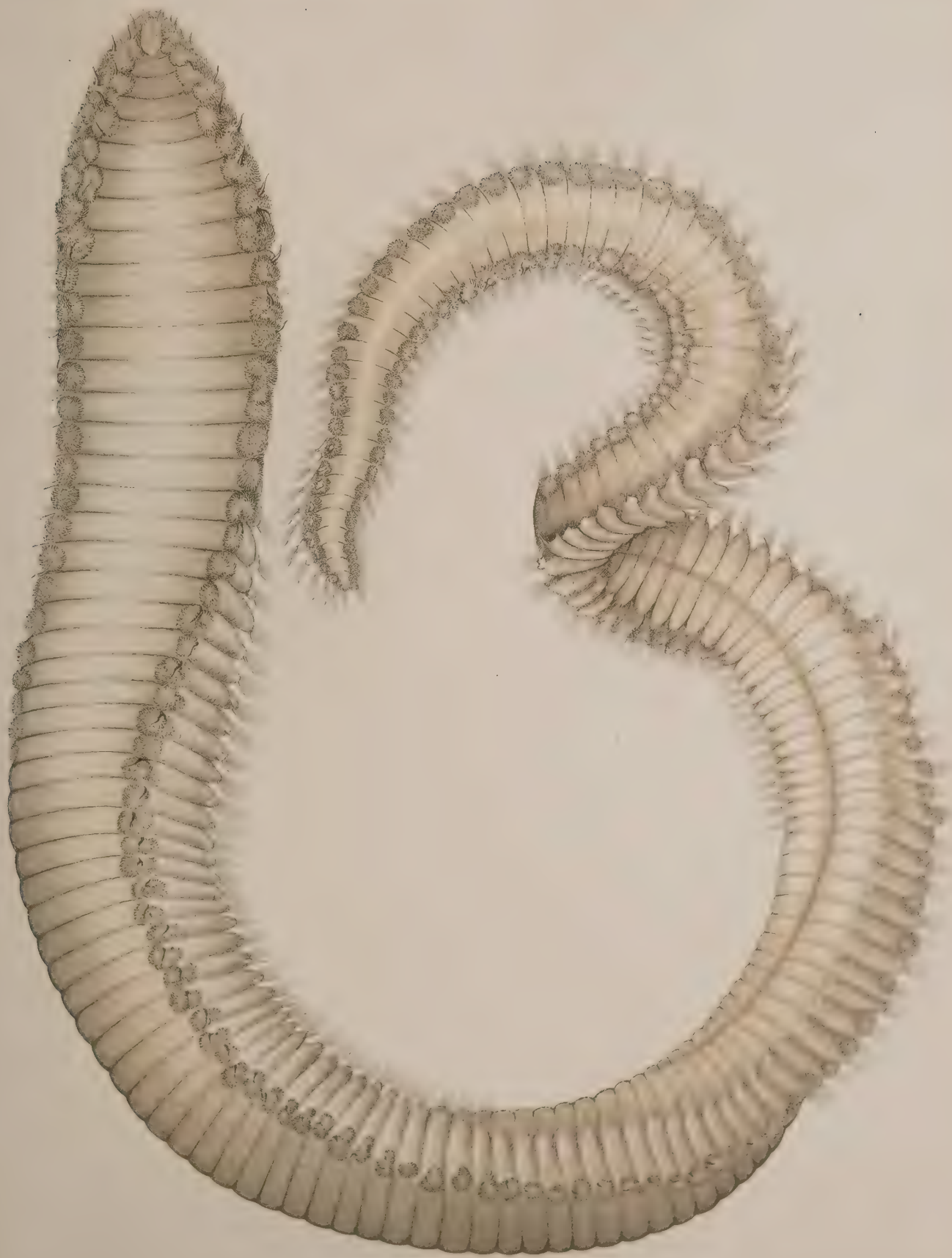


PLATE VI.

PLATE VI.

Fig. 1. Dorsal view of *Lætmonice producta*, . . Very slightly enlarged.

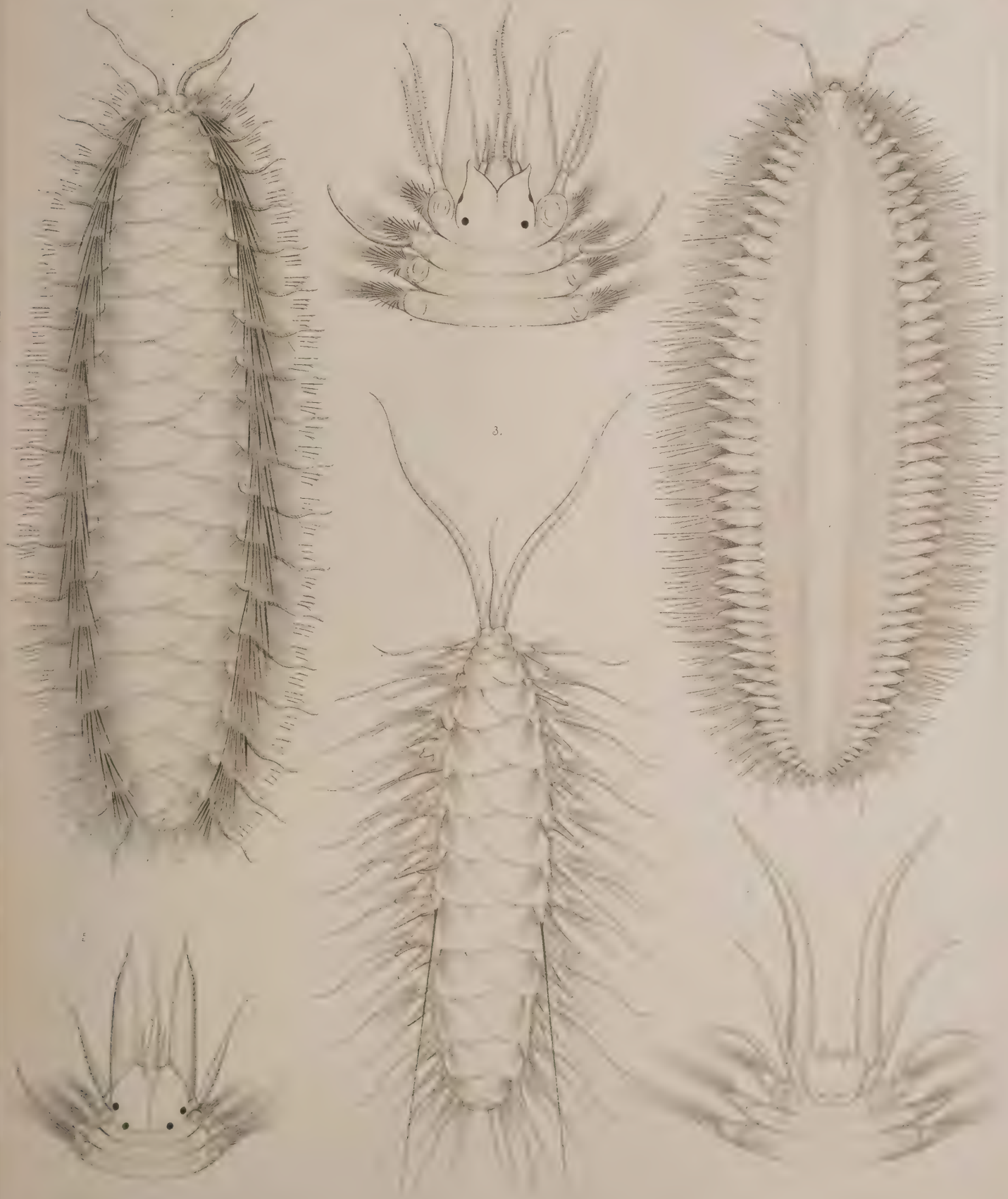
Fig. 2. Ventral view of another example, ... Similarly enlarged.

Fig. 3. Dorsal view of *Lætmonice producta*, var. *willemoesii*, . . Enlarged.

Fig. 4. Head and anterior region of *Evarne kerguelenensis*, . . Enlarged.

Fig. 5. Anterior extremity of *Lagisca darwini*. Probably a young (immature) form, ... Enlarged.

Fig 6 Anterior end of *Lagisca* (*Agnodice*) *moseleyi*, . . . Enlarged.



APHRODITIDÆ & POLYNOIDÆ.

PLATE VII.

PLATE VII.

Fig. 1. Dorsal view of *Aphrodita echidna*, ... Enlarged.

Fig. 2. Ventral view of the same.

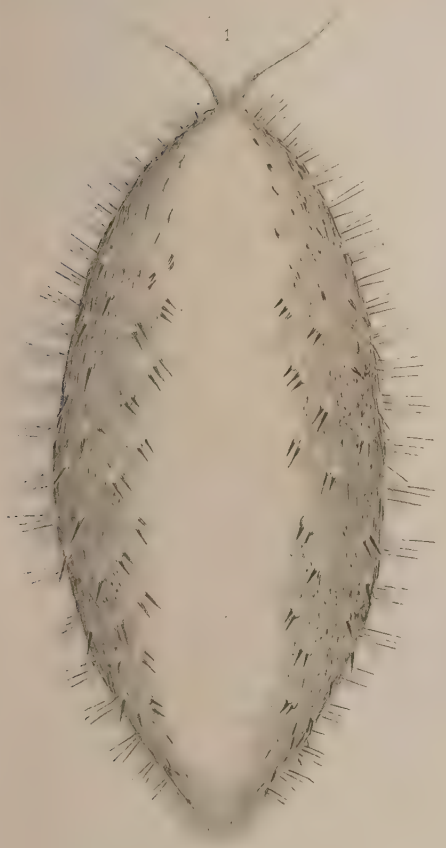
Fig. 3. *Lætmonice producta*, var. *wyvillei*. Dorsal view, . . . Enlarged.

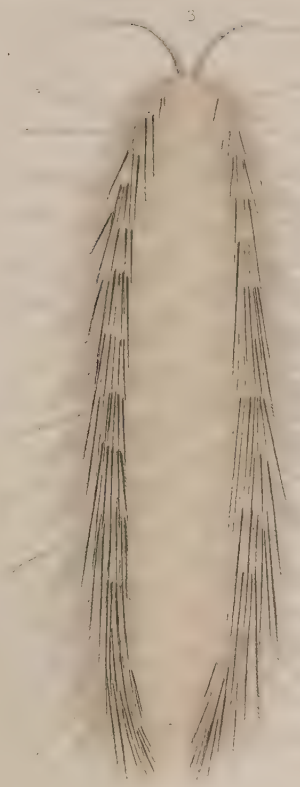
Fig. 4. *Lætmonice aphroditoides*. Dorsal view, ... Enlarged.

Fig. 5. Ventral view of the same.

Fig. 6. Dorsal view of *Aphrodita australis*, ... Enlarged.

Fig. 7. Ventral view of the same.


1


3

6

4

7

5

PLATE VIII.

PLATE VIII.

Fig. 1. Dorsal view of *Lætmonice japonica*, ... Enlarged.

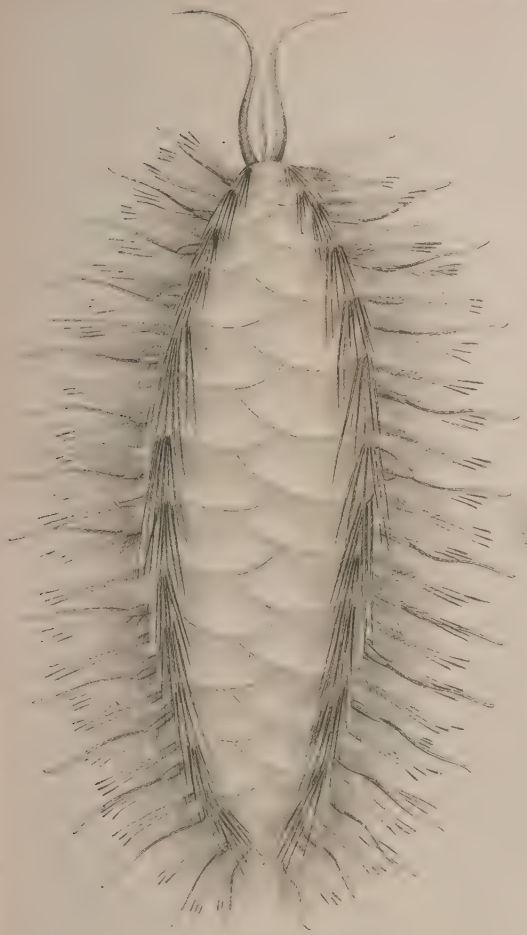
Fig. 2. Dorsal view of *Lætmonice producta*, var. *assimilis*, . . Enlarged.

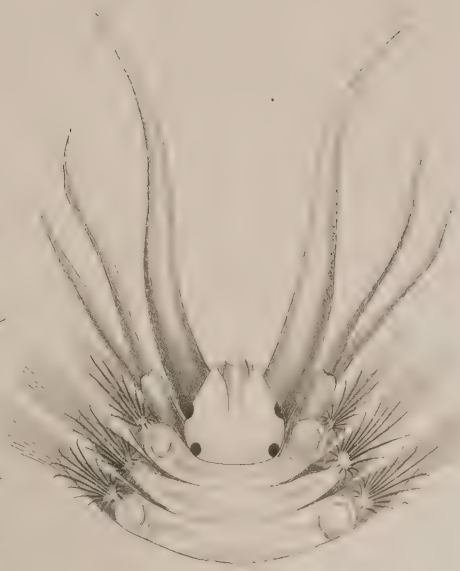
Fig. 3. Dorsal aspect of *Hermione hystrix*, ... Enlarged.

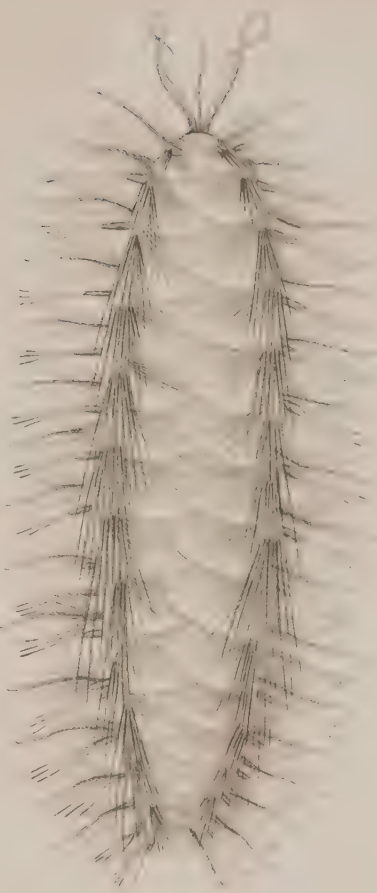
Fig. 4. Dorsal view of *Lætmonice producta*, var. *benthaliana*, . . Enlarged.

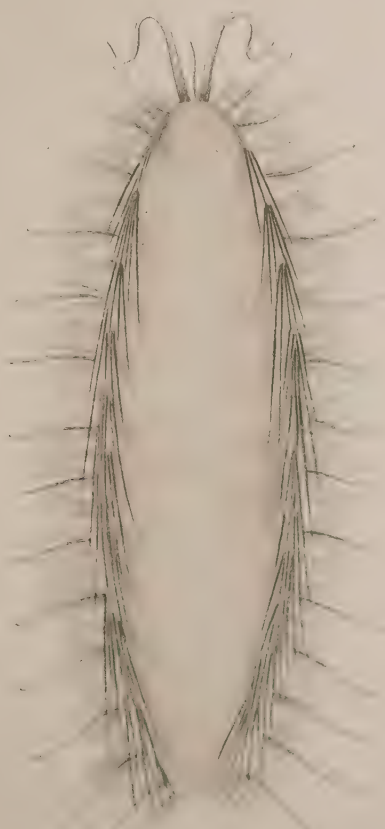
Fig. 5. Ventral view of the same.

Fig. 6. Dorsal view of the anterior extremity of *Lagisca crosetensis*, . Enlarged.









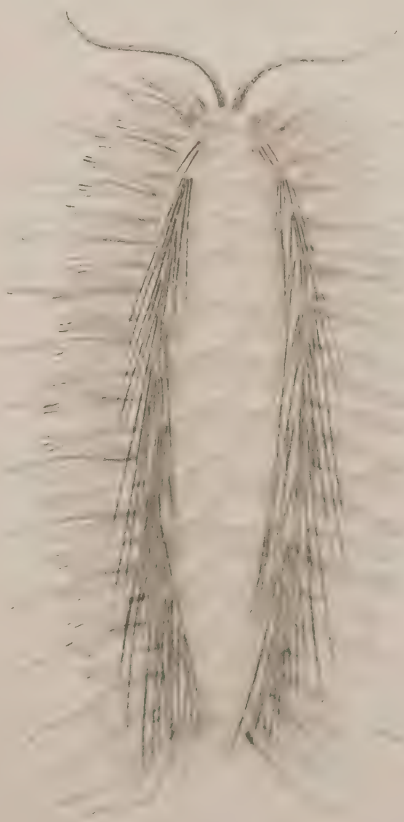


PLATE IX.

PLATE IX.

Fig. 1. Dorsal view of *Palmyra aurifera*, ... Enlarged.

Fig. 2. Ventral view of the same.

Fig. 3. Dorsal aspect of *Euphione elisabethæ*, ... Enlarged.

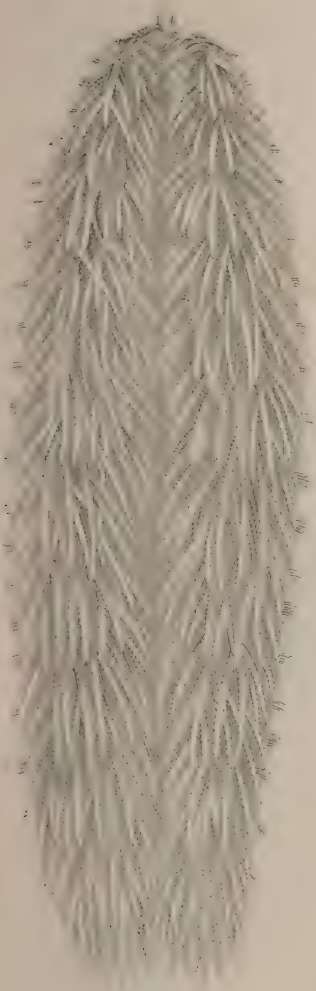
Fig. 4. *Iphionella cimex*, ... Enlarged.

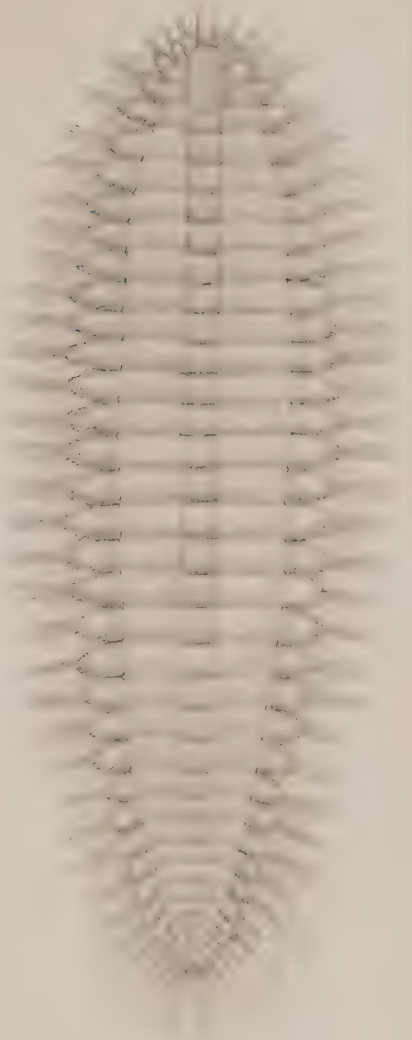
Fig. 5. First scale of *Iphionella cimex*, ... × 20.

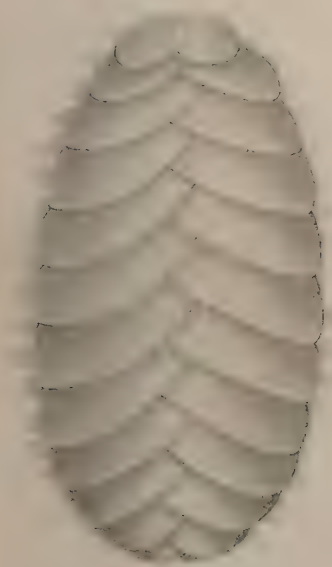
Fig. 6. Scale from the anterior third of *Iphionella cimex*, ... × 12.

Fig. 7. Scale of *Iphione muricata*, ... × 12.

1







PALMYR. DE & POLYN.

PLATE X.

PLATE X.

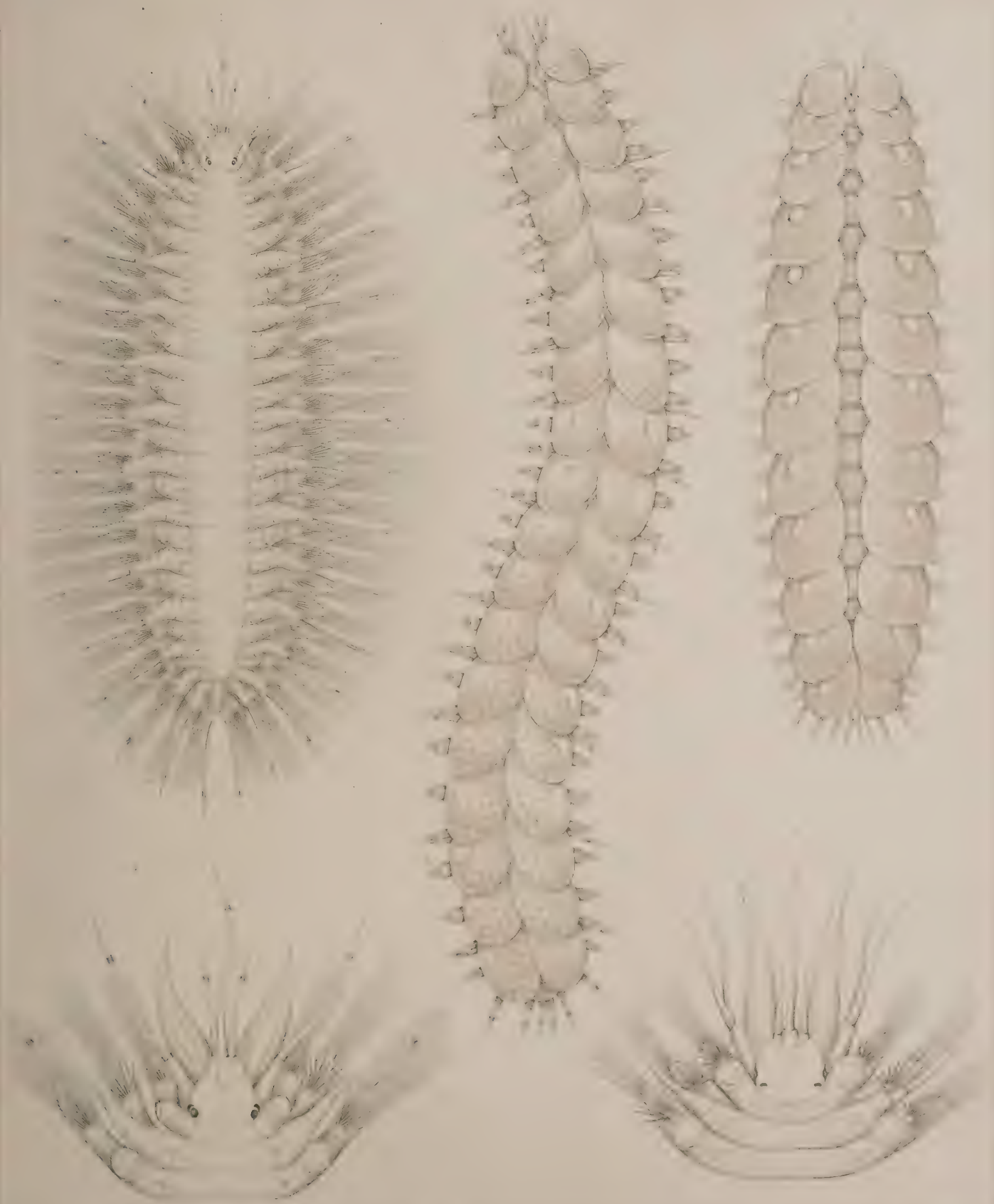
Fig. 1. Dorsal view of *Polynoë iphionoides*, ... Enlarged.

Fig. 2. Head and anterior region of the same. From the dorsal aspect, ... Still further enlarged.

Fig. 3. Dorsal aspect of a male *Polynoë pustulata*. The specimen has somewhat lax scales in front. Anteriorly are the two palpi and the two tentacular cirri, ... Enlarged.

Fig. 4. Dorsal view of *Lepidonotus gymnonotus*, ... Enlarged.

Fig. 5. Anterior end of *Eunoa opalina*. From the dorsal aspect, . . Enlarged.



POLYNOIDÆ

PLATE XI.

PLATE XI.

Fig. 1. Dorsal aspect of *Lepidonotus wahlbergi*, ... Enlarged.

Fig. 2. Dorsal view of *Lepidonotus cristatus*, ... Enlarged.

Fig. 3. More highly magnified dorsal view of the head and anterior region of the same.

Fig. 4. *Polynoëlla levisetosa*. From the dorsal aspect, . . . Enlarged.

Fig. 5. Dorsal view of the head and anterior region of *Hermadion kerguelensis*, ... Somewhat enlarged.

Fig. 6. Posterior extremity of *Eunoa mindanavensis*. From the dorsal aspect, ... Enlarged.

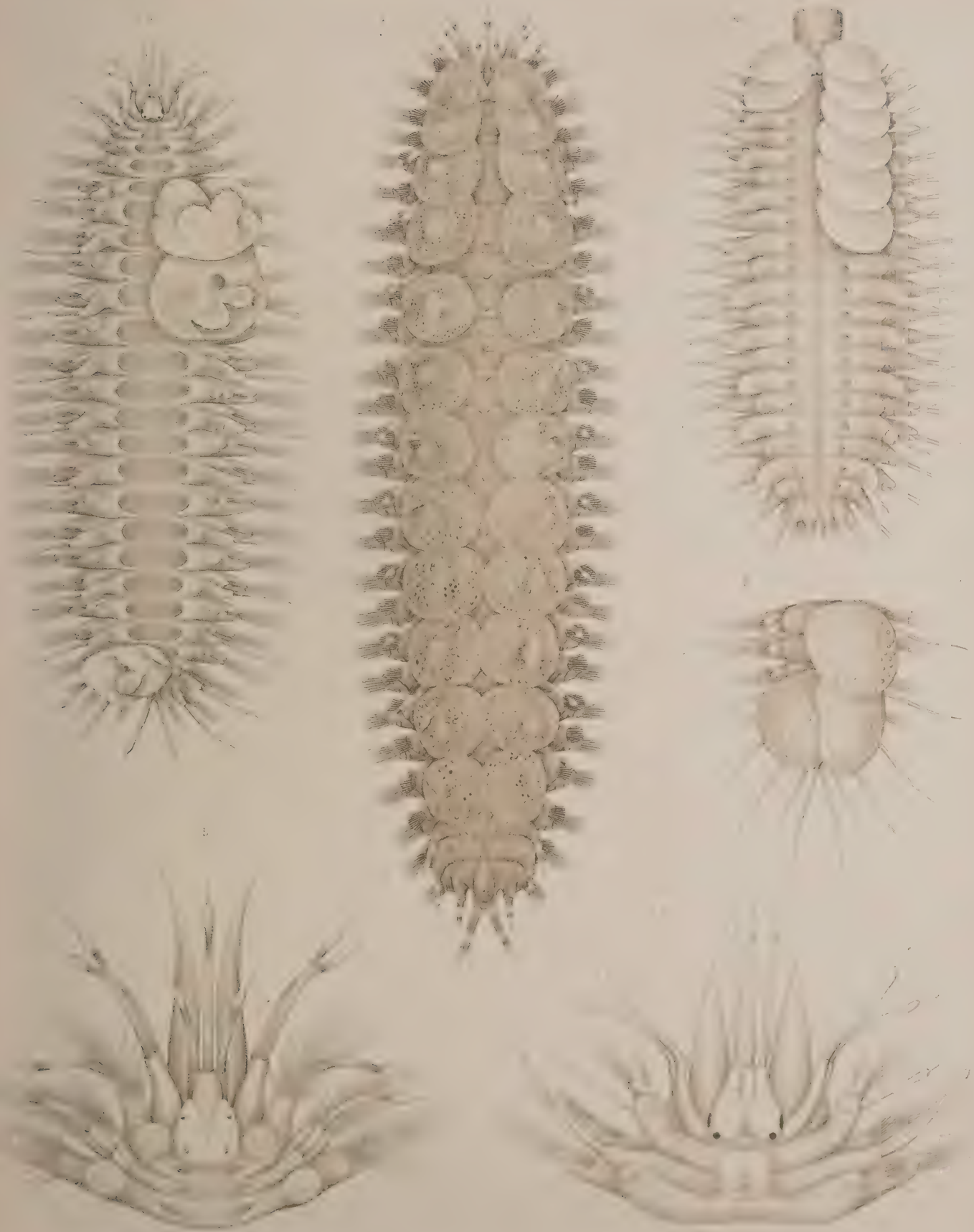


PLATE XII.

PLATE XII.

Fig. 1. Dorsal view of *Hermadion kerguelensis.* The single large long median cirrus below the anus is absent in the specimen figured, ... Enlarged.

Fig. 2. *Polyeunoa lævis.* From the dorsal aspect, . . . Enlarged.

Fig. 3. *Polynoë ocellata.* Dorsal aspect, ... Enlarged.

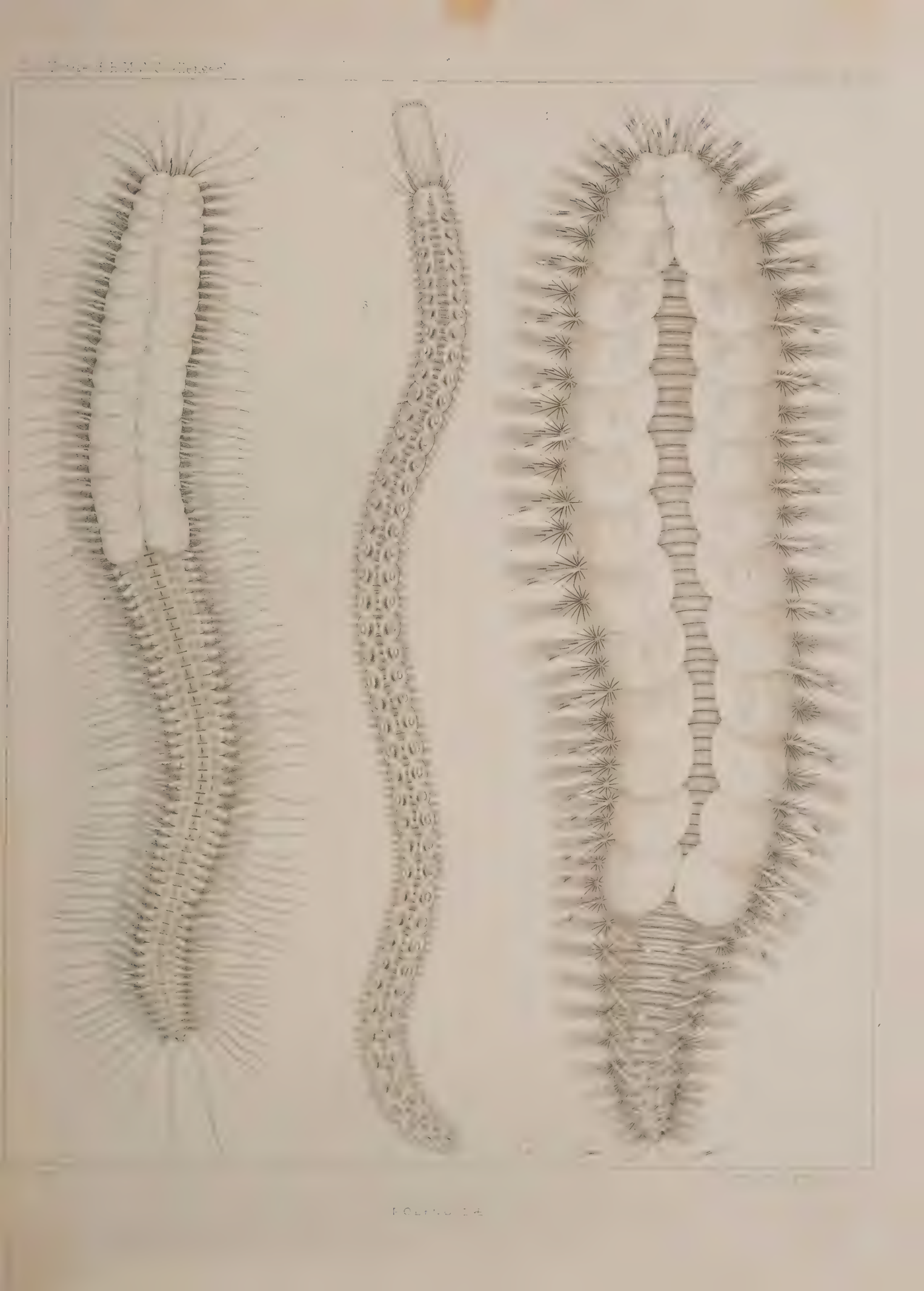


PLATE XIII.

PLATE XIII.

Fig. 1. Dorsal view of *Lagisca antarctica*, ... Enlarged.

Fig. 2. Dorsal aspect of *Lagisca crosetensis*. Most of the cirri and scales are absent, ... Enlarged.

Fig. 3. Dorsal aspect of the head of *Harmothoë benthaliana*, . . Enlarged.

Fig. 4. Head and anterior dorsal region of *Eulagisca corrientis*, . . Enlarged.

Fig. 5. Dorsal aspect of the head and anterior region of *Lagisca magellanica*, ... Enlarged.

Fig. 6. Dorsal view of the anterior end of *Polynoë magnipalpa*, with the proboscis partly extruded, ... Enlarged.

Fig. 7. Similar view of *Scalisetosus ceramensis* (imperfect), . . Enlarged.

Fig. 8. Anterior dorsal view of *Lagisca* (?) *kermadecensis* (imperfect), . Enlarged.

POLYNOIDÆ

PLATE XIV.

PLATE XIV.

Fig. 1. Dorsal view of *Polynoë magnipalpa* (male), . . . Enlarged.

Fig. 2. Head and anterior dorsal view of *Allmaniella setubalensis*,[1] . Enlarged.

Fig. 3. Dorsal view of the head of *Lænilla fusca*,[2] . . . . Enlarged.

Fig. 4. Anterior dorsal aspect of *Polynoë* (*Robertianella*) *synophthalma*, . Enlarged.

Fig. 5. Head and anterior dorsal region of *Polynoë* (*Admetella*) *longipedata*. The proboscis is seen slightly extruded between the bases of the palpi. The processes at the base of the tentacle have been removed, ... Enlarged.

Fig. 6. Dorsal view of a female *Polynoë magnipalpa*, . . . Enlarged.

[1] The engraver has made the lines and shading on the dorsum too formal.

[2] The engraver has erroneously indicated the shading round the posterior eyes.

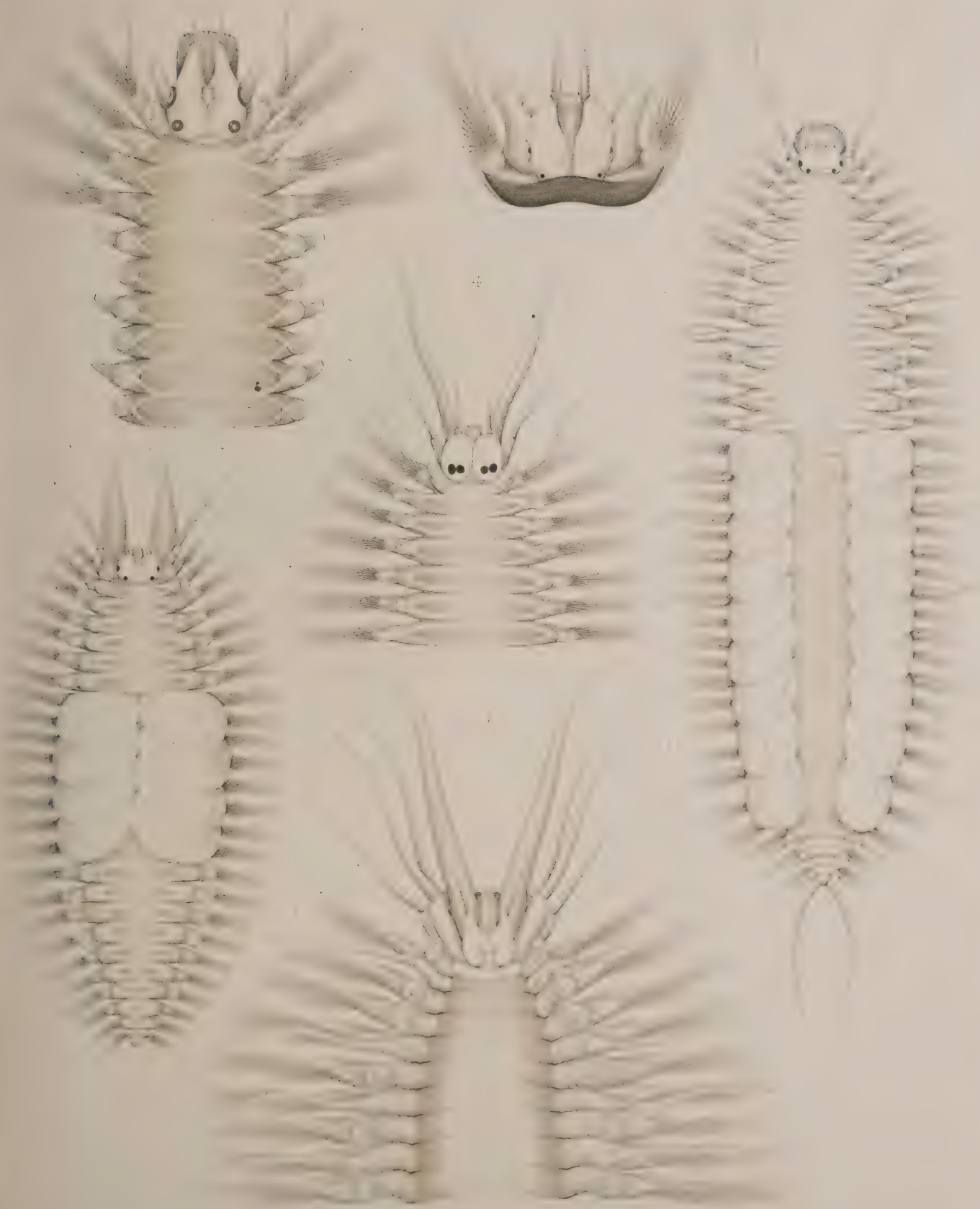


PLATE XV.

PLATE XV.

Fig. 1. Dorsal view of *Polynoë capensis*, ... Enlarged.

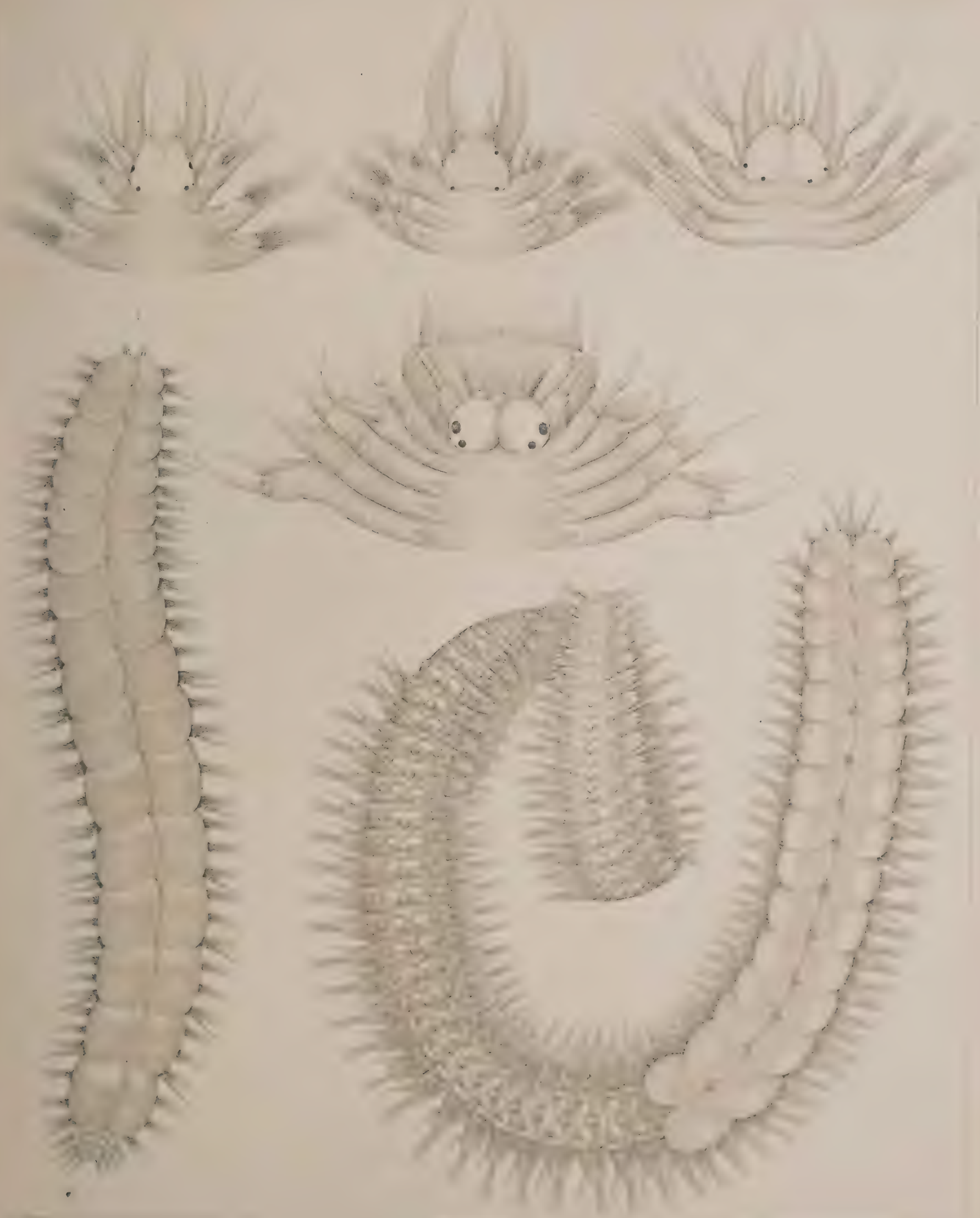
Fig. 2. Similar view of *Polynoë attenuata*. The palpi are absent, . Enlarged.

Fig. 3. Dorsal aspect of the head of *Polynoëlla levisetosa*, with the proboscis extruded, ... Enlarged.

Fig. 4. Dorsal view of the head of *Eunoa yedoensis*, . . . Enlarged.

Fig. 5. Similar aspect of the head of *Eunoa capensis*, . . . Enlarged.

Fig. 6. Dorsal aspect of the head and anterior region of *Polynoë* (*Langerhansia*) *euplectellæ*. The specimen was softened, . . Enlarged.



POLYNOIDÆ

PLATE XVI.

PLATE XVI.

Fig. 1. Dorsal aspect of *Polynoë* (*Macellicephala*) *mirabilis*, . . Enlarged.

Fig. 2. Dorsal view of *Polynoë platycirrus*, ... Enlarged.

Fig. 3. Head of *Lagisca antarctica*. Viewed from the dorsum, . . Enlarged.

Fig. 4. Partially protruded proboscis of *Polynoëlla levisetosa*. Viewed from the ventral surface, ... Enlarged.

Fig. 5. *Eurythoë pacifica*, var. *levukaensis*. From the dorsal aspect, . Enlarged.

POLYNOIDÆ

PLATE XVII.

PLATE XVII.[1]

Fig. 1. Scale of *Lepidonotus cristatus*, as a transparent object and somewhat compressed, ... × 18.

Fig. 2. Posterior scale of *Polynoë pustulata*, as a transparent object. The papillæ are flattened by the cover-glass, . . . × 20.

Fig. 3. Space in the scale (from the anterior third) of *Iphionella cimex*, . × 210.

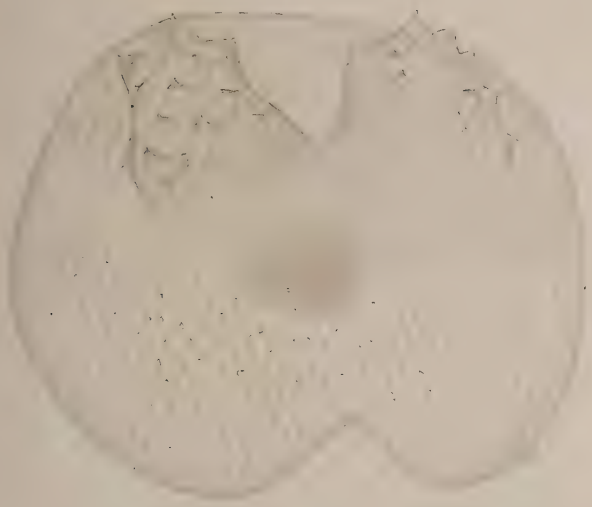
Fig. 4. Scale from the anterior third of *Eunoa iphionoides*, . . × 20.

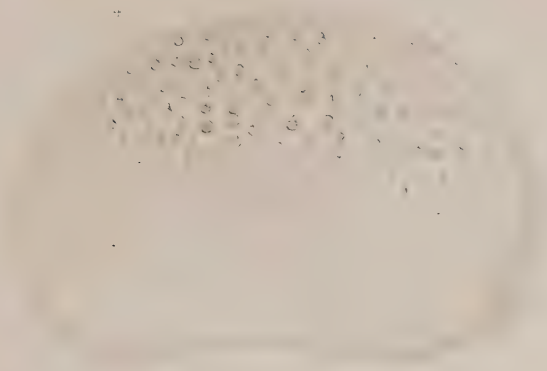
Fig. 5. Scale of *Lepidonotus gymnonotus*, ... × about 6.

Fig. 6. Posterior scale of *Eunoa mindanavensis*, ... × 40.

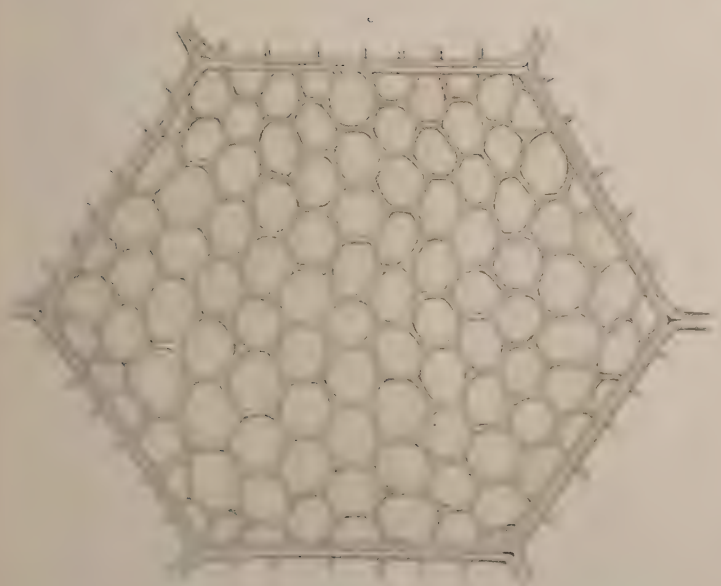
Fig. 7. Portion of a scale of *Euphione elisabethæ*, showing the tubercles by transmitted light, ... × 90.

[1] The scales are seen by transmitted light as transparent objects.





6.



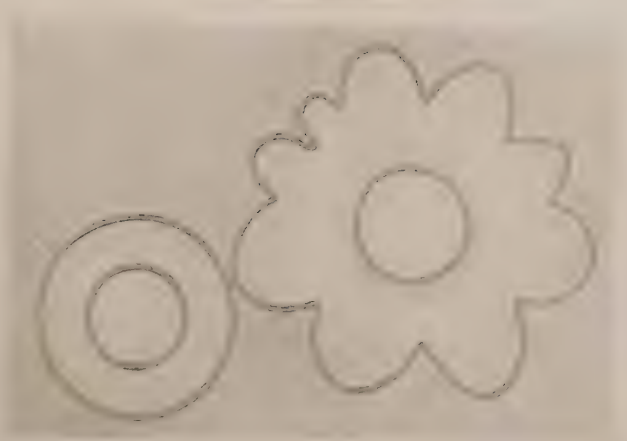


PLATE XVIII.

PLATE XVIII.

Fig. 1. Posterior margin of the first scale of *Lagisca antarctica*, . . × 90.

Fig. 2. Outer edge of the second scale of *Lagisca magellanica*, var. *grubei*, ... × 350.

Fig. 3. Margin of the first scale of *Lagisca magellanica*, ... × 350.

Fig. 4. Portion of a scale of the same, ... × 210.

Fig. 5. Entire scale from the anterior third of *Polynoë magnipalpa*, . × 20.

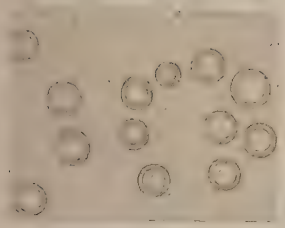
Fig. 6. Portion of a scale of *Polynoëlla levisetosa*, showing remarkable reticulations, ... × 350.

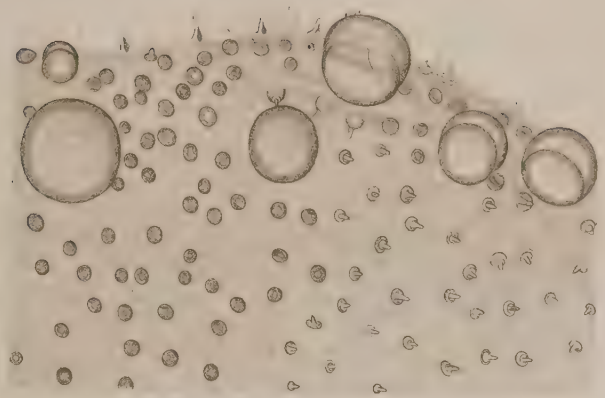
Fig. 7. Anterior scale of *Lagisca crosetensis*, ... × 20.

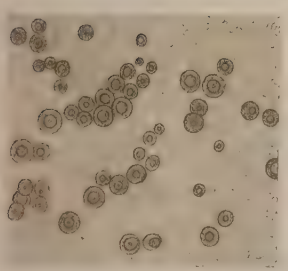
Fig. 8. Scale of *Lepidonotus wahlbergi*. Viewed as a transparent object, × 15.

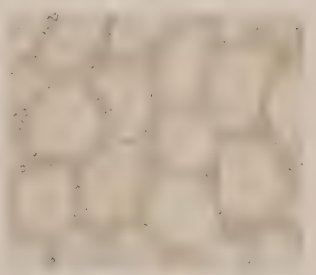
Fig. 9. Edge of a scale of *Lagisca tenuisetis*, ... × 350.

Fig. 10. Portion of the edge of a scale of *Euphione elisabethæ*, . . × 350.









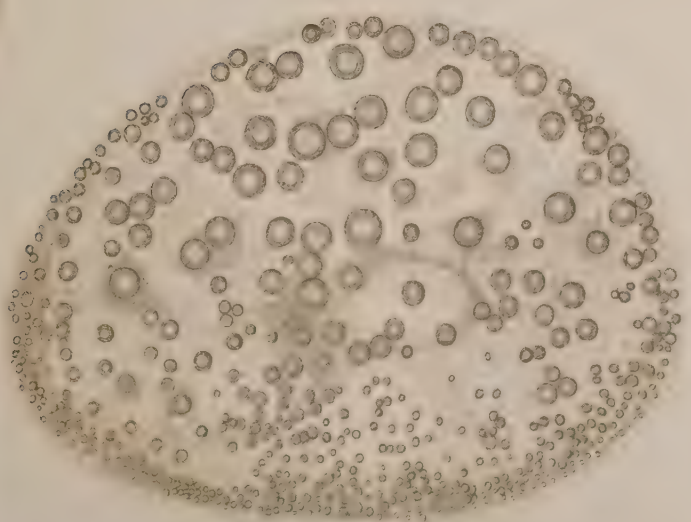


PLATE XIX.

PLATE XIX.

Fig. 1. Scale from the anterior region of *Lagisca magellanica*, var. *murrayi*, ... × about 12.

Fig. 2. First scale of *Eunoa opalina*, ... × about 12.

Fig. 3. Scale from the anterior third of *Polynoë platycirrus*, . . × about 12.

Fig. 4. Scale from the middle of *Polynoë capensis*. The lines are due to the wrinkles, not to the nerves, and the engraver has made the grains of dark pigment to the left of the scar look like the spinous tubercles in a triangular group on the right, . × 20.

Fig. 5. Posterior scale of *Lagisca darwini*, viewed as a transparent preparation. Most of the granules are hypodermic, . . × 350.

Fig. 6. Scale of *Evarne kerguelensis*. Most of the slender cilia are covered with parasitic growths, ... × about 30.

Fig. 7. Scale of *Polynoë* (*Langerhansia*) *euplectellæ*, . . . × about 20.

Fig. 8. Scale of *Polynoëlla levisetosa*, ... × about 20.

Fig. 9. Scale of *Eunoa yedoensis*, ... × about 40.

Fig. 10. Head and anterior region of *Thalenessa fimbriata*, . . Enlarged.

Fig. 11. Head and anterior region of *Eulepis wyvillei*. Most of the bristles have been removed, and the first pair of scale-pedicels somewhat overlap the head, ... Enlarged.

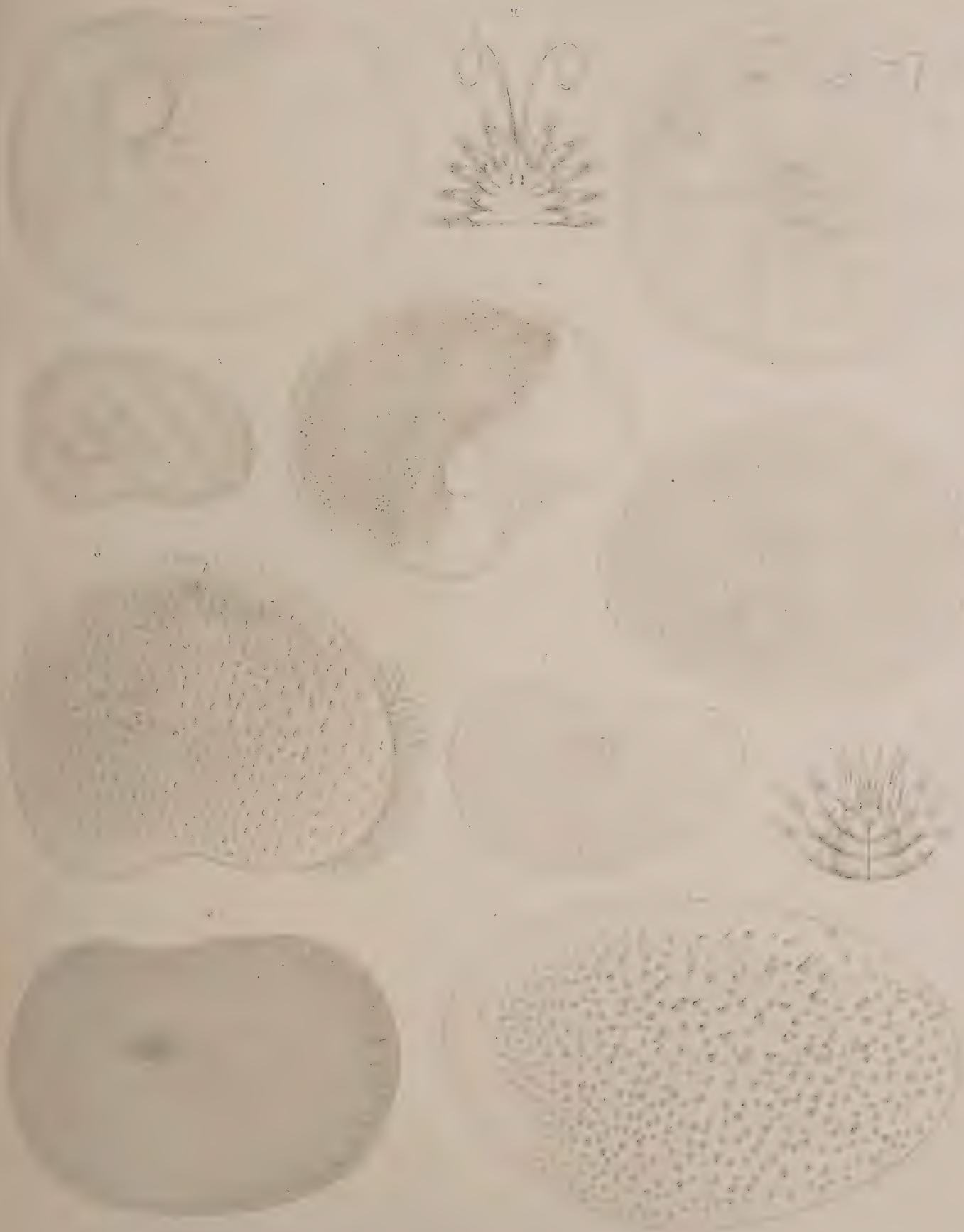


PLATE XX.

PLATE XX.

Fig. 1. *Eulepis challengeriæ*, viewed from the dorsal surface, . . Enlarged.

Fig. 2. Dorsal aspect of *Eulepis wyvillei*, ... Enlarged.

Fig. 3. Ventral view of the same.

Fig. 4. Anterior dorsal view of *Leanira lævis*, ... Enlarged.

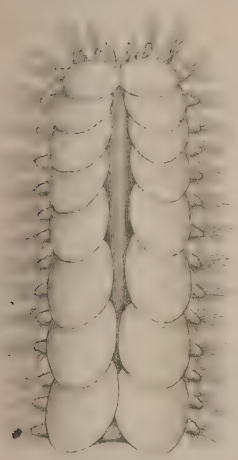
Fig. 5. Foot from the anterior third of *Polynoë* (*Robertianella*) *synophthalma*, ... × about 15.

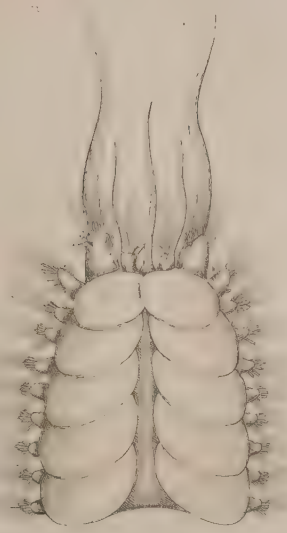
Fig. 6. Foot from the anterior third of *Polynoë* (*Admetella*) *longipedata*. The upper region has been somewhat flattened out so as to overlap the foot, ... Enlarged.

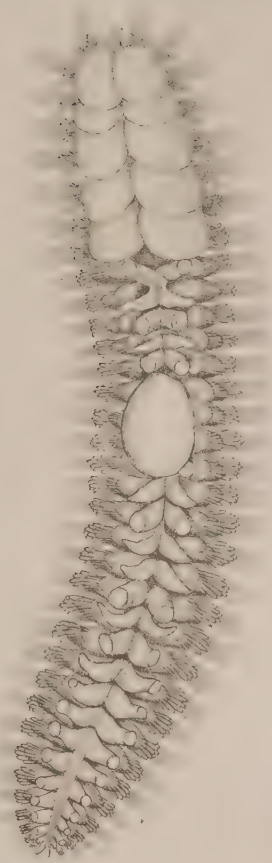
Fig. 7. Scale of *Harmothoë benthaliana*, ... × about 55.

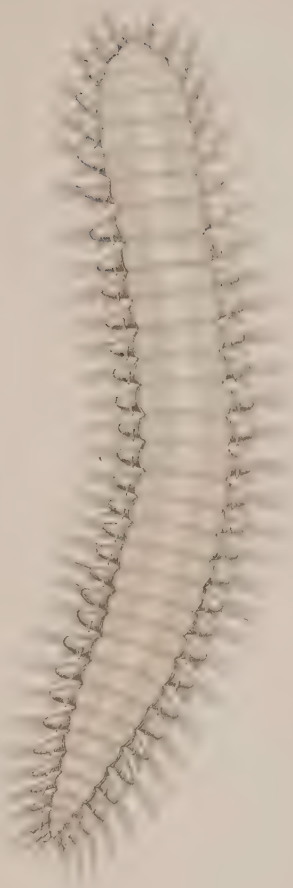
Fig. 8. Scale from the anterior third of *Polyeunoa lævis*, . . × about 20.

Fig. 9. Scale from the anterior third of *Polynoë attenuata*, . . × about 20.









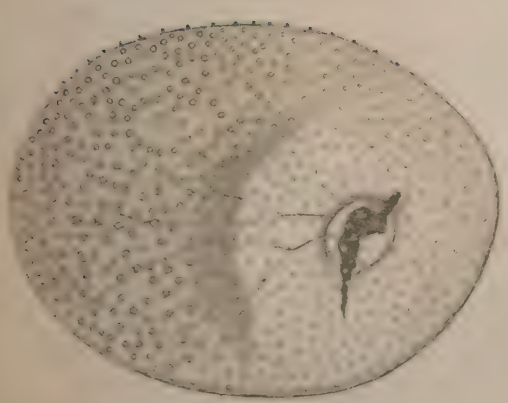


PLATE XXI.

PLATE XXI.

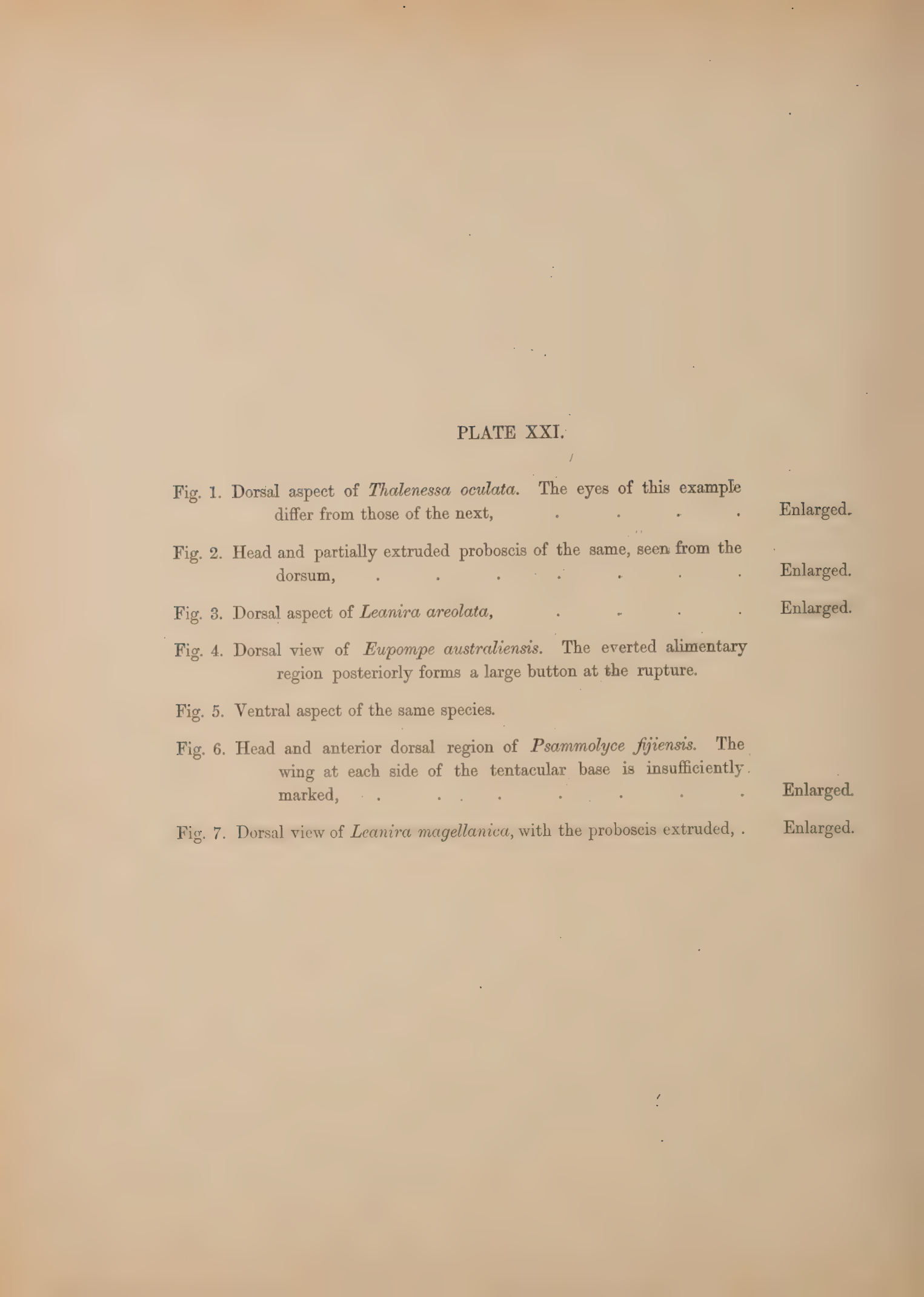


Fig. 1. Dorsal aspect of *Thalenessa oculata*. The eyes of this example differ from those of the next, ... Enlarged.

Fig. 2. Head and partially extruded proboscis of the same, seen from the dorsum, ... Enlarged.

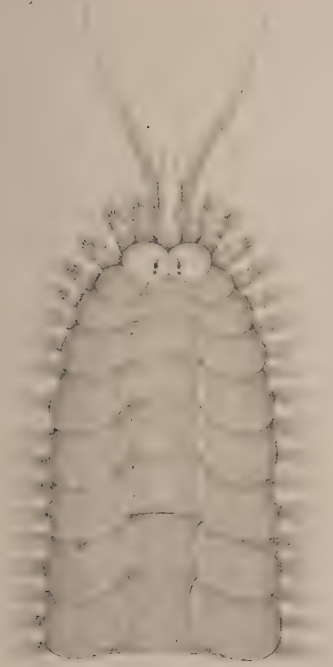
Fig. 3. Dorsal aspect of *Leanira areolata*, ... Enlarged.

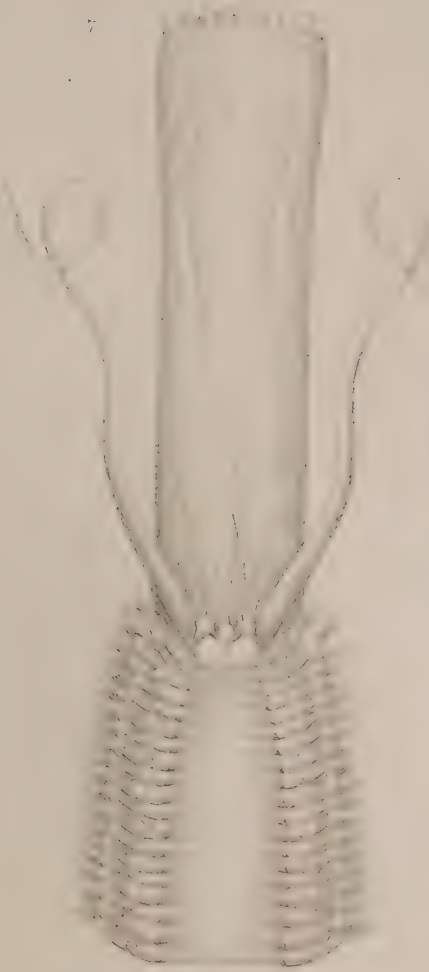
Fig. 4. Dorsal view of *Eupompe australiensis*. The everted alimentary region posteriorly forms a large button at the rupture.

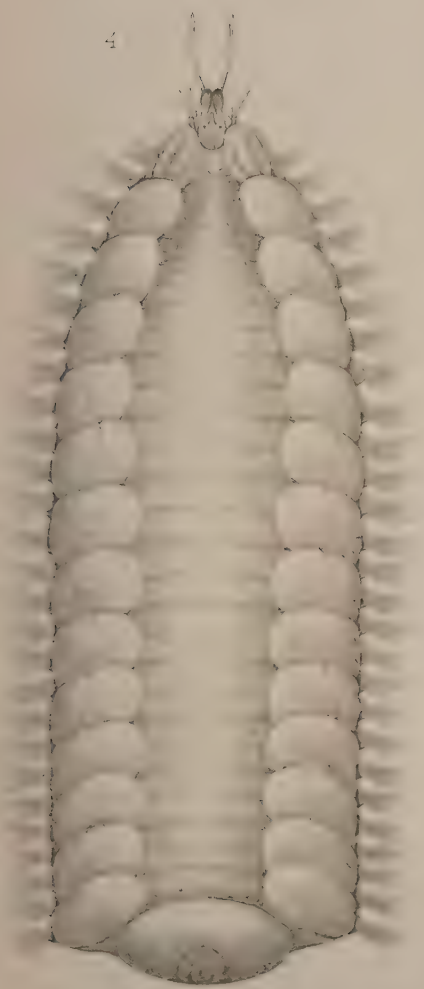
Fig. 5. Ventral aspect of the same species.

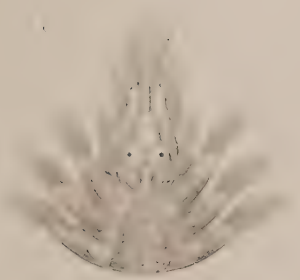
Fig. 6. Head and anterior dorsal region of *Psammolyce fijiensis*. The wing at each side of the tentacular base is insufficiently marked, ... Enlarged.

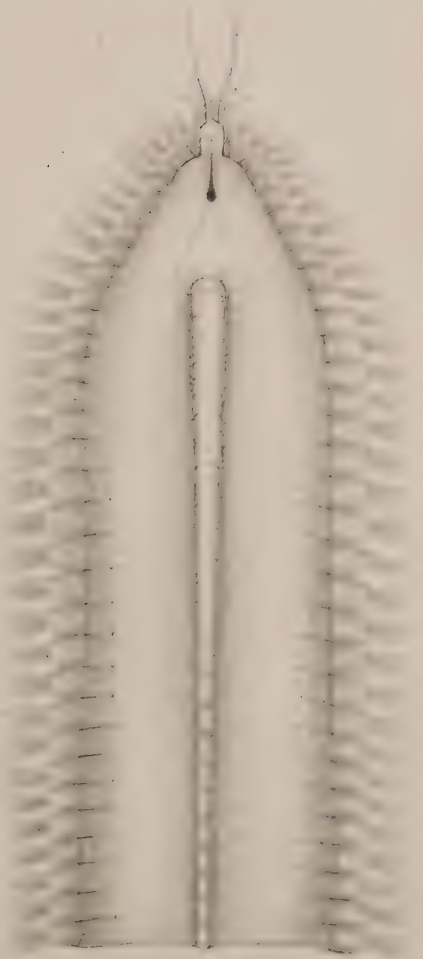
Fig. 7. Dorsal view of *Leanira magellanica*, with the proboscis extruded, . Enlarged.











SIGALIONIDÆ & ACŒTIDÆ.

PLATE XXII.

PLATE XXII.

Fig. 1. Dorsal view of *Sigalion buskii*, ... Enlarged.

Fig. 2. Dorsal aspect of the head and neighbouring region of *Thalenessa digitata*. A small hook draws back the fold covering the head. The specimen unfortunately appears to have been dried in front, Enlarged.

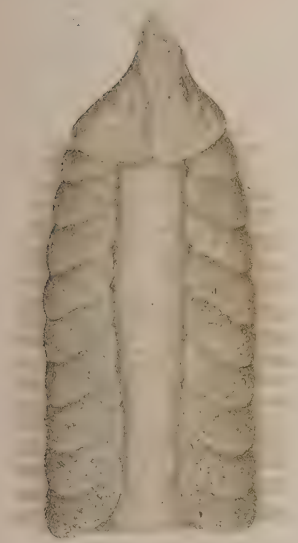
Fig. 3. Dorsal view of the head and anterior region of *Leanira japonica*, . Enlarged.

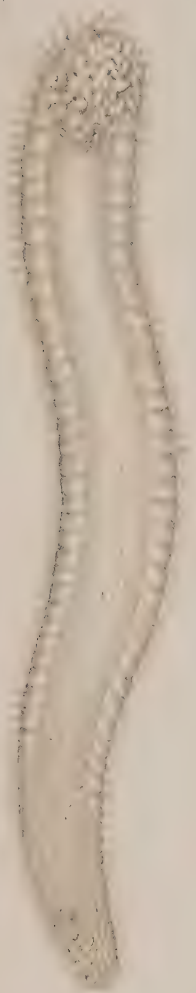
Fig. 4. Dorsum of the anterior region of *Psammolyce fijiensis*, . . Enlarged.

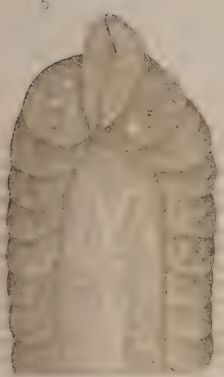
Fig. 5. The same region of *Psammolyce occidentalis*, . . . Enlarged.

Fig. 6. Dorsal view of *Eupholoë philippensis*. The tentacle is not so distinct as in nature, ... Enlarged.

Fig. 7. Head of the same. The scales have been removed, and the nuchal fold has been retracted so as to show the head, . Still more enlarged.







S GALIONIDÆ &c

PLATE XXIII.

PLATE XXIII.

Fig. 1. Ventral aspect of the anterior region of *Eulepis challengeriæ*, . Enlarged.

Fig. 2. Ventral view of the anterior region of *Psammolyce occidentalis*, Enlarged.

Fig. 3. Dorsal aspect of the head and anterior region of the same. The palpi have no connection with the first feet, which lie above them.

Fig. 4. Anterior region of *Thalenessa fimbriata*, viewed from the dorsum, ... Enlarged.

Fig. 5. Anterior dorsal region of *Thalenessa digitata*, . . . Enlarged.

Fig. 6. Foot of the same, ... × about 20.

Fig. 7. Scale of the foregoing, ... × about 20.

Fig. 8. Foot of *Eupompe australiensis*. From the front. The articulation of the dorsal cirrus is almost hidden, . . × about 20.

Fig. 9. Scale of *Leanira hystricis*, ... × about 20.

Fig. 10. Scale of *Leanira lævis*, ... × about 20.

Fig. 11. Foot from the anterior third of *Leanira lævis*, . . . × about 25.

Fig. 12. Papilla from scale of *Thalenessa oculata*, . . . × 210.

Fig. 13. Foot (mounted in Farrant's solution) from the anterior third of *Leanira magellanica*, ... × about 20.

ALIONIDÆ &c.

PLATE XXIV.

PLATE XXIV.

Fig. 1. Foot of *Eulepis challengeriæ*. The specimen was not very well preserved, ... × 40.

Fig. 2. Foot of *Eulepis wyvillei*, ... × about 20.

Fig. 3. "Bite" in the first scale of *Eulepis wyvillei*, . . . × 250.

Fig. 4. Papillæ on first scale of *Eupompe australiensis*, . . . × 80.

Fig. 5. Foot of *Thalenessa fimbriata*, ... × 20.

Fig. 6. Fimbriæ on the translucent margin of the scale of *Psammolyce fijiensis*, ... × 350.

Fig. 7. Scale of *Eupholoë philippensis*, ... × 90.

PLATE XXV.

PLATE XXV.

Fig. 1. Scale from anterior third of *Thalenessa fimbriata*, . . × about 35.

Fig. 2. Marginal papilla of the foregoing, ... × 300.

Fig. 3. Scale of *Thalenessa oculata*, ... × about 20.

Fig. 4. First foot of *Thalenessa digitata*, ... × about 20.

Fig. 5. Marginal papilla on anterior scale of the foregoing, . . × 350.

Fig. 6. Scale of *Leanira magellanica*, ... × about 20.

Fig. 7. Portion of the foregoing, showing papillæ, . . . × 350.

Fig. 8. Ciliated margin of a scale (from the middle) of *Leanira areolata*, × about 20.

Fig. 9. Papillæ on the margin of the same, ... × 320.

Fig. 10. Fimbriæ of the scale of *Eupholoë philippensis*, . . . × 350.

Fig. 11. Scale of *Eulepis wyvillei*, ... × about 20.

LITH. ANST. v. J. BACH, LEIPZIG

PLATE XXVI.

PLATE XXVI.

Fig. 1. Anterior dorsal region of *Nephthys trissophyllus* (Station 151). Proboscis partly extruded, ... Slightly enlarged.

Fig. 2. Tip of the tail of the foregoing specimen, viewed from the dorsum, Enlarged.

Fig. 3. Anterior dorsal region of *Nephthys trissophyllus*, from Kerguelen, Enlarged.

Fig. 4. Ventral aspect of the anterior region of *Nephthys trissophyllus*, with extruded proboscis, from Balfour Bay, Kerguelen, . Enlarged.

Fig. 5. Dorsal view of *Nephthys trissophyllus*, with proboscis extruded, . Enlarged.

Fig. 6. Dorsal view of the anterior region of *Nephthys verrilli*, . . Enlarged.

Fig. 7. Similar view of same species, with the proboscis extruded, . Enlarged.

Fig. 8. Dorsal view of *Nephthys dibranchis*, from the Arafura Sea, showing projection (from rupture) of the dorsal muscles.

Fig. 9. The same (*Nephthys dibranchis*) in profile, . . Not so much enlarged.

Fig. 10. Dorsal aspect of the anterior region of *Nephthys phyllobranchia*, with the proboscis partly extruded. . . . Enlarged.

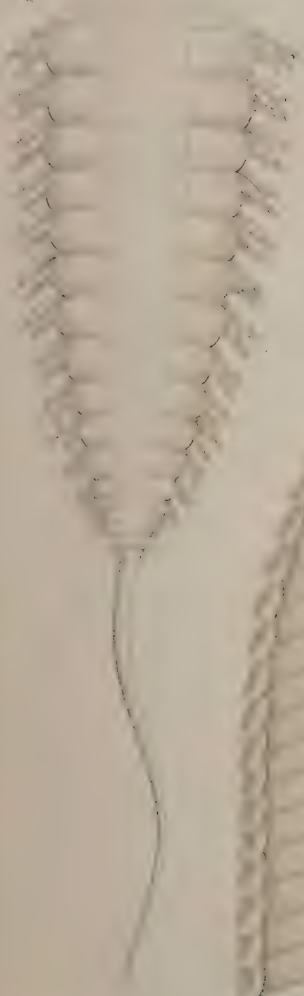


PLATE XXVII.

PLATE XXVII.

Fig. 1. Foot of *Nephthys trissophyllus*, from Kerguelen. A few parasitic Nematoids are attached to the branchia, . . . × about 8.

Fig. 2. Foot of *Nephthys malmgreni* (?), (from the anterior third), . × about 40.

Fig. 3. Foot of *Nephthys phyllobranchia*, 1240 fathoms, . . . × 55.

Fig. 4. Foot of *Nephthys trissophyllus*, from the front. The ventral cirrus is viewed nearly on edge. It is lanceolate, . . . × about 8.

Fig. 5. Foot of *Nephthys dibranchis*. The papilla at the base of the upper branchia is hidden, and the foot is somewhat flattened from softening, ... × about 20.

Fig. 6. Outline of a scale of *Psammolyce occidentalis*, . . . × about 20.

Fig. 7. Head and anterior region of *Eulalia capensis*, . . . Enlarged.

Fig. 8. Head and anterior region (with everted proboscis) of *Phyllodoce duplex*, ... Enlarged.

Fig. 9. Head and anterior region of *Phyllodoce* (*Anaitis*) *sanctæ vincentis*, Enlarged.

PLATE XXVIII.

PLATE XXVIII.

Fig. 1. Dorsal view of the head and anterior region of *Genetyllis oculata*, . Enlarged.

Fig. 2. Dorsal aspect of *Alciopa antarctica*,[1] . . . . Enlarged.

Fig. 3. Head and anterior dorsal region of the same, . . Still further magnified.

Fig. 4. Ventral view of the foregoing region, . . Similarly magnified.

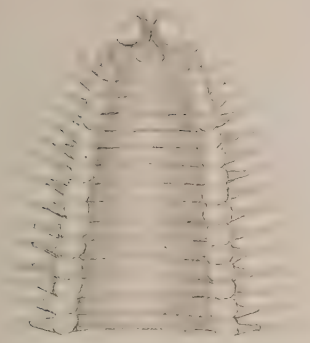
Fig. 5. Dorsal aspect of *Greeffia oahuensis*, ... Enlarged.

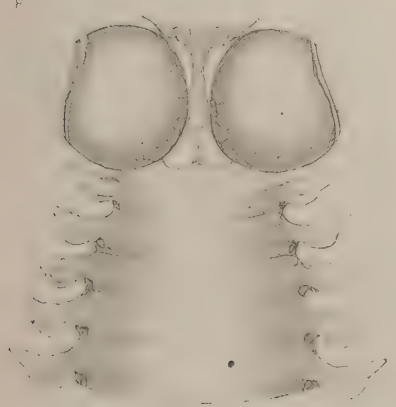
Fig. 6. Head and anterior region of the same, viewed from the dorsum, More highly magnified.

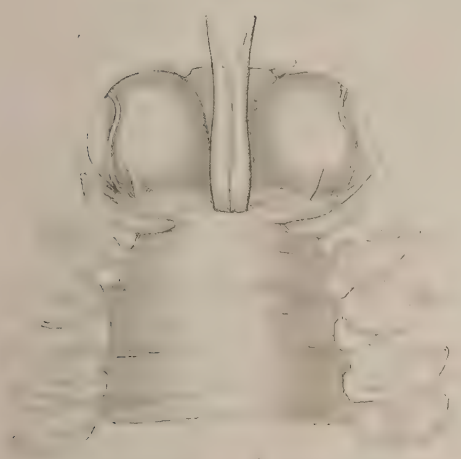
Fig. 7. Ventral aspect of the foregoing, . . . Similarly magnified.

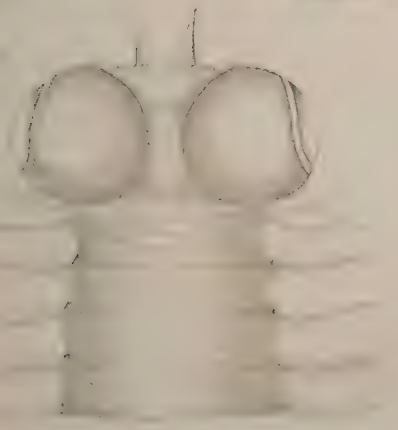
Fig. 8. Dorsal aspect of the head and anterior region of *Alciopa quadri-oculata*. The feet were quite pulpy and membranous from decay, so that they are only indicated in the drawing, . Enlarged.

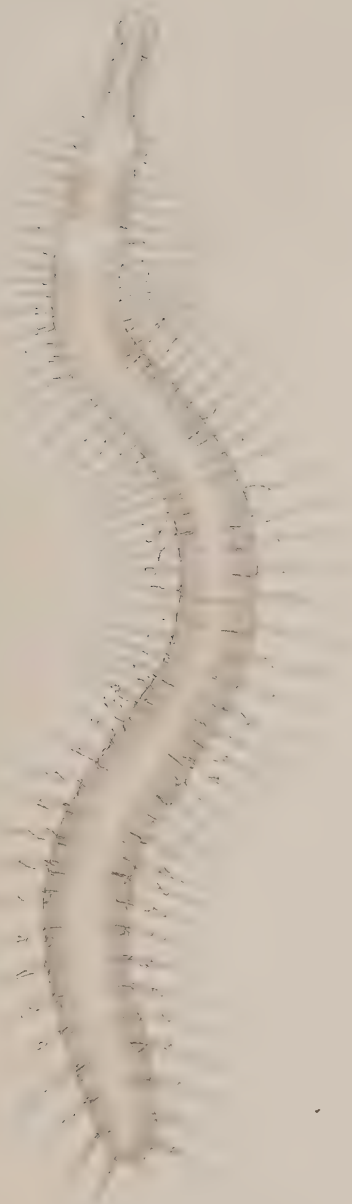
[1] The Alciopidæ were in an indifferent condition.











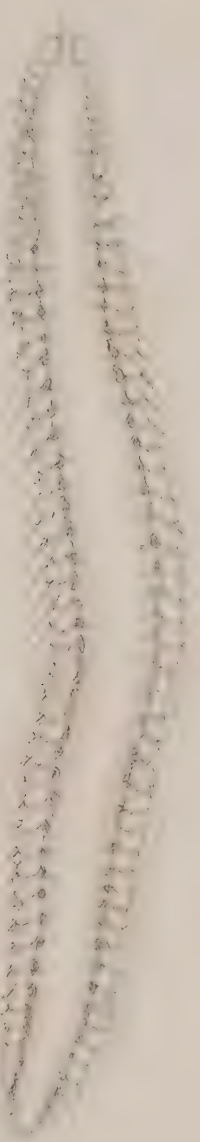


PLATE XXIX.

PLATE XXIX.

Fig. 1. Dorsal view of *Hesione* (*Fallacia*) *pantherina*, . . . Enlarged.

Fig. 2. Dorsal aspect of *Hesione pacifica*, ... Enlarged.

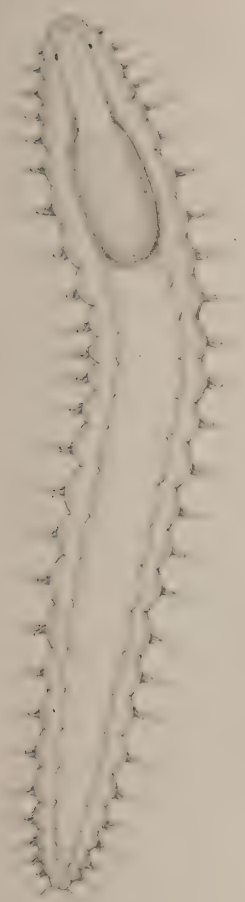
Fig. 3. Head and anterior dorsal region of *Dalhousia atlantica*, . . Enlarged.

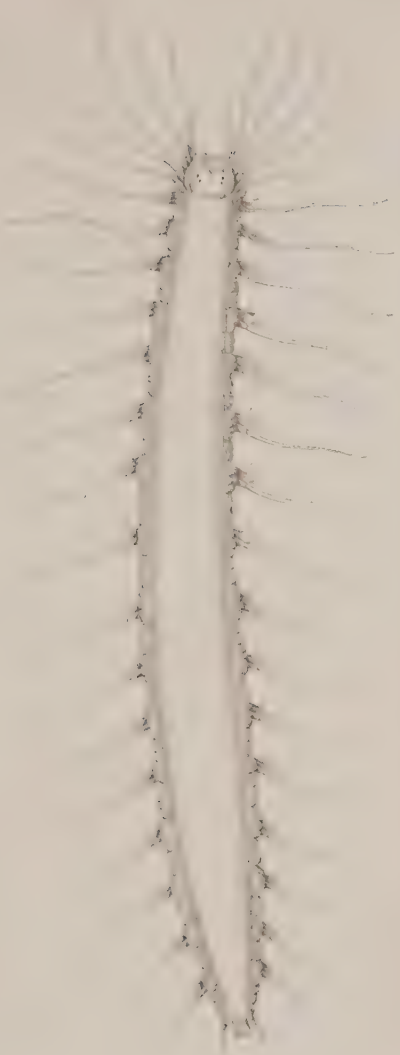
Fig. 4. Head and anterior dorsal region of *Eusyllis kerguelensis*, . . Enlarged.

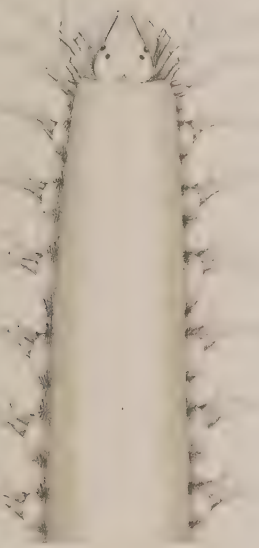
Fig. 5. Enlarged dorsal view of *Sphærosyllis kerguelensis*, . . × about 20.

Fig. 6. Head and anterior dorsal view of *Autolytus maclearanus*. The two pale dorsal marks on the second body-segment are the bases of cirri, ... Enlarged.

Fig. 7. Ventral aspect of the head and anterior region of *Alciopa quadrioculata*. The condition of the feet has been already explained, ... Enlarged.







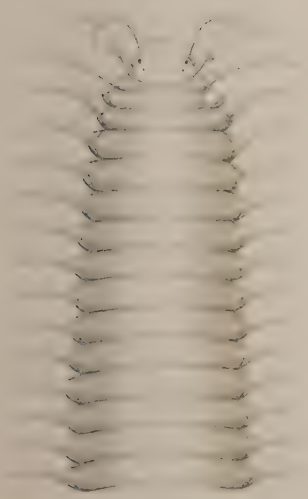


PLATE XXX.

PLATE XXX.

Fig. 1. Head and anterior dorsal region of *Syllis gigantea*, . . Enlarged.

Fig. 2. Ventral view of the same region, ... Enlarged.

Fig. 3. Dorsal view of the posterior extremity of the foregoing, . . Enlarged.

Fig. 4. Head and anterior dorsal region of *Salvatoria kerguelensis*, . Enlarged.

Fig. 5. Head and anterior dorsal region of *Syllis setubalensis*, . . Enlarged.

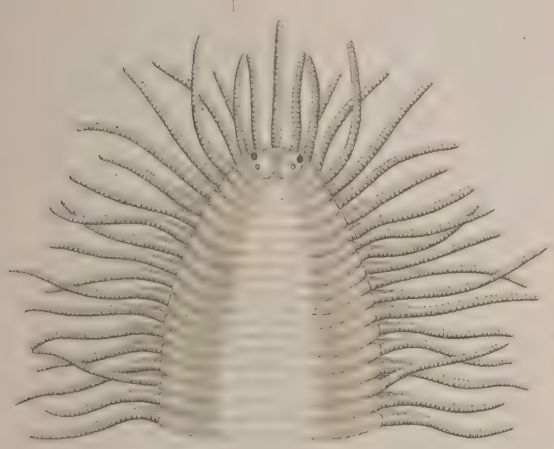
Fig. 6. Ventral view of the same region, ... Enlarged.

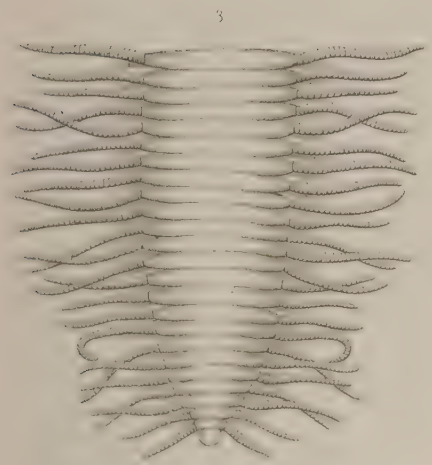
Fig. 7. Dorsal view of the head and anterior region of *Syllis brasiliensis*, Enlarged.

Fig. 8. Foot of *Nephthys trissophyllus*, var., ... Enlarged.

Fig. 9. Dorsal aspect of the anterior region of *Lumbriconereis punctata*, . Enlarged.

Fig. 10. Foot of *Laranda longa*, from the front. *a*, papilla; *b*, spine; *c*, winged bristles. Other spines appear below the latter, . × 400.





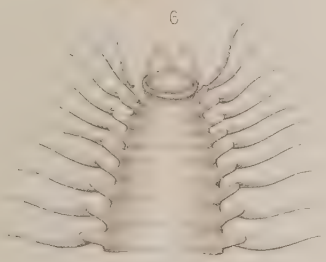


PLATE XXXI.

PLATE XXXI.

Fig. 1. *Syllis ramosa.* The specimen has no head, and is otherwise fragmentary, ... Enlarged.

PLATE XXXII.

PLATE XXXII.

Fig. 1. Anterior region of *Eunoa iphionoides*, ... Enlarged.

Fig. 2. Head of *Eupolynoë mollis*, ... Enlarged.

Fig. 3. Head and anterior region of *Harmothoë haliaëti*, . . . Enlarged.

Fig. 4. Portion of the surface of a scale of the same, . . . × 55.

Fig. 5. Edge of a posterior scale of the same, ... × 55.

Fig. 6. Head and anterior region of *Polynoë ascidioides*, . . Enlarged.

Fig. 7. Posterior border of a scale of *Dasylepis equitis*, . . . × 55.

Fig. 8. Thirtieth foot of *Phyllodoce* (*Anaitis*) *sanctæ vincentis*, . . × 40.

Fig. 9. Thirtieth foot of *Phyllodoce duplex*, . . . × 24.

Fig. 10. Thirtieth foot of *Eulalia capensis*, . . . × 24.

Fig. 11. Foot of *Greeffia oahuensis*, ... × 18.

Fig. 12. Middle foot of *Alciopa antarctica*, from Honolulu, . . × 18.

Fig. 13. Foot of *Alciopa antarctica*, variety, . . × 24.

Fig. 14. Anterior foot of *Hesione pacifica*, ... × 25.

Fig. 15. Foot of *Hesione* (fragment), from St. Thomas, West Indies, . × 25.

Fig. 16. Foot of *Hesione* (*Fallacia*) *pantherina*, ... × 25.

THE RAY SOCIETY. J.G. BACH. LE. F.L.S.

PLATE XXXIII.

PLATE XXXIII.

Fig. 1. Foot of *Salvatoria kerguelensis.* The upper bristle should have been simple, ... × 90.

Fig. 2. Anterior foot of *Dalhousia atlantica*, before complete formation. The dorsal cirrus is broken, ... × 18.

Fig. 3. Foot of *Eusyllis kerguelensis*, ... × 24.

Fig. 4. Anterior foot of *Syllis gigantea*, ... × 24.

Fig. 5. Anterior foot of *Autolytus macleavanus*, ... × 40.

Fig. 6. Foot of *Syllis setubalensis*, ... × 55.

Fig. 7. Foot of *Syllis brasiliensis*, ... × 90.

Fig. 8. Anterior region of *Syllis capensis*, ... × 24.

Fig. 9. Anterior foot of the foregoing, somewhat folded, so as to affect the distance between the cirrus and setigerous process, . . × 90.

Fig. 10. Foot of *Sphærosyllis kerguelensis*, ... × 90.

Fig. 11. Female bud of *Syllis ramosa*, viewed from the ventral surface and somewhat flattened out. A younger bud comes off exactly opposite, ... × 55.

Fig. 12. Foot from the anterior third of the foregoing bud, . . × 80.

Fig. 13. Posterior foot of male bud of *Syllis ramosa*, with the ventral cirrus somewhat flattened, ... × 55.

Fig. 14. Anterior foot of *Syllis ramosa* (parent stock), . . . × 50.

Fig. 15. Anterior region of *Exogone heterosetosa*, from the ventral surface, × 90.

Fig. 16. Two embryos of the foregoing, ... × 90.

PLATE XXXIV.

PLATE XXXIV.

Fig. 1. Anterior region of *Syllis robertianæ*, ... × about 25.

Fig. 2. Anterior foot of the foregoing, ... × 55.

Fig. 3. Head and anterior region of *Nereis kobiensis*, ... Enlarged.

Fig. 4. Tenth foot of the foregoing, ... × 25.

Fig. 5. Thirty-seventh foot of the same, ... × 25.

Fig. 6. Maxilla of the same species, ... × 25.

Fig. 7. Head and anterior region of *Nereis tongatabuensis*, . . Enlarged.

Fig. 8. Tenth foot of the same, ... × 25.

Fig. 9. Thirty-seventh foot of the foregoing, ... × 25.

Fig. 10. Head and anterior region of *Nereis arafurensis*. The palpi have been bent downward and inward, ... Enlarged.

Fig. 11. Tenth footh of the same, ... × 25.

Fig. 13. Thirty-seventh foot of the foregoing, ... × 25.

Fig. 14. Head and anterior region of *Nereis melanocephala*, . . Enlarged.

Fig. 15. Tenth foot of the same, ... × 25.

Fig. 16. Thirty-seventh foot of the same, ... × 25.

Fig. 17. Sixty-seventh foot of the foregoing, ... × 40.

PLATE XXXV.

PLATE XXXV.

Fig. 1. Head and anterior region of *Nereis atlantica*, . . . Enlarged.

Fig. 2. Tenth foot of the foregoing, ... × 40.

Fig. 3. Fifty-seventh foot of the same, ... × 40.

Fig. 4. Head and anterior region of *Nereis longisetis*, . . . Enlarged.

Fig. 5. Head and anterior region of *Nereis eatoni*, . . . Enlarged.

Fig. 6. Proboscis of the same, with maxillæ and paragnathi. From a small specimen, ... Enlarged.

Fig. 7. Head and anterior region of *Nereis antillensis*, . . . Enlarged.

Fig. 8. Tenth foot of the same, ... × 40.

Fig. 9. Twenty-sixth foot of the foregoing, ... × 40.

Fig. 10. Head, proboscis, and anterior region of *Nereis kerguelensis*, . Enlarged.

Fig. 11. Tenth foot of the same, ... × 25.

Fig. 12. Thirty-seventh foot of the foregoing, ... × 25.

Fig. 13. Head and anterior region of *Nereis patagonica*. The terminal bosses of the palpi are doubled under, . . . Enlarged.

Fig. 14. Tenth foot of a small example of the foregoing, . . . × 40.

Fig. 15. Thirty-seventh foot of a large example of the same, . . × 25.

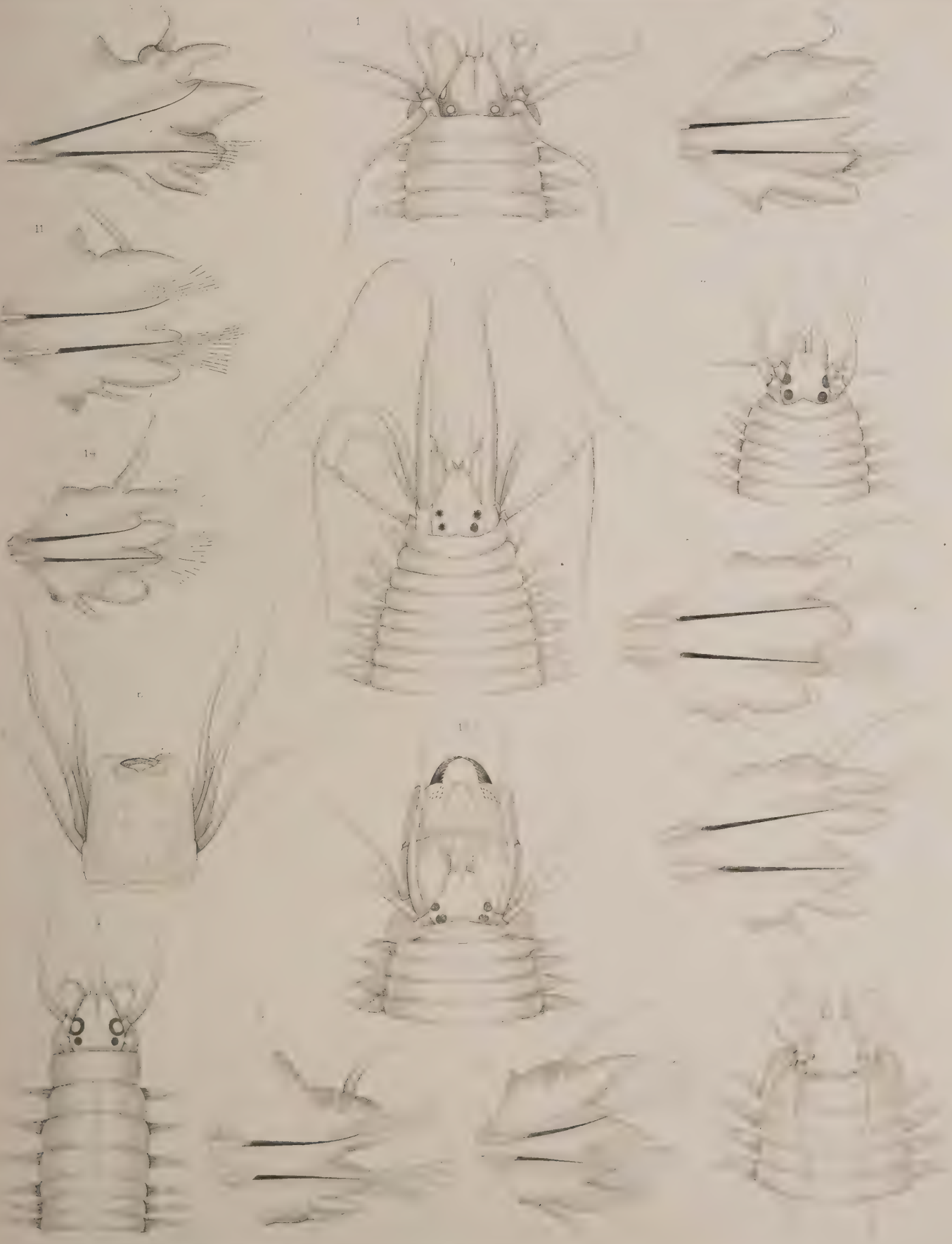


PLATE XXXVI.

PLATE XXXVI.

Fig. 1. Head and anterior end of *Nereis brasiliensis*, . . . Enlarged.

Fig. 2. Tenth foot of the same, ... × 25.

Fig. 3. Thirty-seventh foot of the foregoing, ... × 25.

Fig. 4. Anterior foot of *Staurocephalus atlanticus;* indifferently preserved, × 80.

Fig. 5. Head and anterior region of the same species, . . . Enlarged.

Fig. 6. Foot of *Staurocephalus australiensis*, ... × 25.

Fig. 7. Anterior region (dorsal view) of *Lumbriconereis pettigrewi*, . Enlarged.

Fig. 8. Tenth foot of the same, ... × 40.

Fig. 9. Thirtieth foot of the foregoing, ... × 40.

Fig. 10. Dorsal aspect of the anterior region of *Lumbriconereis bifurcata*, . Enlarged.

Fig. 11. Ventral view of the anterior region of the same species, . . Enlarged.

Fig. 12. Posterior foot of the foregoing, ... × 40.

Fig. 13. Dorsal view of the anterior region of *Lumbriconereis japonica*, Enlarged.

Fig. 14. Tenth foot of the same, ... × 25.

Fig. 15. Posterior foot of the foregoing, seen partly from below, . . × 25.

Fig. 16. Dorsal aspect of the anterior region of *Lumbriconereis kerguelensis*, Enlarged.

Fig. 17. Fiftieth foot of the foregoing, ... × 80.

Fig. 18. Dorsal view of the anterior region of *Lumbriconereis neo-zealaniæ*. The longitudinal grooves on the dorsum have not been shown, Enlarged.

Fig. 19. Thirty-third foot of the same, seen obliquely from below, . × 80.

Fig. 20. Dorsal view of the anterior region of *Lumbriconereis abyssorum*, Enlarged.

Fig. 21. Thirtieth foot of the same, ... × 80.

SPIONIDÆ, LUMBRINEREIDÆ &c.

PLATE XXXVII.

PLATE XXXVII.

Fig. 1. Dorsal view of the anterior region of *Lumbriconereis heteropoda*, Enlarged.

Fig. 2. Fiftieth foot of the same, ... × 25.

Fig. 3. Dorsal aspect of the anterior region of *Notocirrus capensis*, . Enlarged.

Fig. 4. Fiftieth foot of the foregoing. The bristles are pressed upward, . × 40.

Fig. 5. Dorsal view of the anterior region of *Laranda longa*, . . Enlarged.

Fig. 6. Dorsal aspect of the head and adjoining region of *Nematonereis schmardæ*, ... Enlarged.

Fig. 7. Thirtieth foot of the same, ... × 80.

Fig. 8. Hundredth foot of the foregoing (upper bristles incomplete), × 80.

Fig. 9. Anterior dorsal view of *Lumbriconereis ehlersii*, var. *tenuisetis*, . Enlarged.

Fig. 10. Foot of *Nematonereis* (fragment), from Sea Point, near Cape Town, ... × 80.

Fig. 11. *Nematonereis* (fragment), from St. Vincent, . . . × 80.

Fig. 12. Dorsal view of the anterior region of *Eunice magellanica*, . Enlarged.

Fig. 13. Maxillæ and dental plates of the foregoing, . . . × 12.

Fig. 14. Mandibles of the same, ... × 12.

Fig. 15. Twentieth foot of the same, ... × 18.

Fig. 16. Dorsal aspect of the anterior region of *Eunice prognatha*, . Enlarged.

Fig. 17. Thirtieth foot of the same, ... × 18.

Fig. 18. Anterior ventral region of *Eunice torresiensis*.[1] A pedicellaria is fixed to one of the processes.

Fig. 19. Twentieth foot of the same, ... × 18.

Fig. 20. Maxillæ and dental plates of an adult of the foregoing, . . × about 8.

Fig. 21. Mandibles of an adult of the same, ... × about 8.

[1] The engraver has erroneously added an outer row to the unpaired left lateral series of teeth, instead of merely showing a dark brown pigment-band, as in the original.

PLATE XXXVIII.

PLATE XXXVIII.

Fig. 1. Head and anterior region of *Eunice ærstedi* (?), . . . Enlarged.

Fig. 2. Twentieth foot of the foregoing, ... × 18.

Fig. 3. Anterior dorsal view of *Eunice vittata*, var., . . . Enlarged.

Fig. 4. Tenth foot of the foregoing, ... × 40.

Fig. 5. Thirtieth foot of the same, ... × 40.

Fig. 6. Ventral view of the anterior region of a large specimen of *Marphysa goodsiri*, ... Enlarged.

Fig. 7. Twentieth foot of the foregoing, ... × 25.

Fig. 8. Fortieth foot of the same, somewhat compressed inferiorly, . × 25.

Fig. 9. Maxillæ and dental plates of *Eunice cirrobranchiata*, . . × 12.

Fig. 10. Mandibles of the same, ... × 12.

Fig. 11. Fiftieth foot of a large example of the foregoing, . . . × 18.

Fig. 12. Head and anterior dorsal region of *Eunice kobiensis*, . . Enlarged.

Fig. 13. Twentieth foot of the foregoing, ... × 25.

Fig. 14. Anterior dorsal view of *Eunice edwardsi*, . . . Enlarged.

Fig. 15. Twentieth foot of the same, ... × 25.

Fig. 16. Anterior dorsal region of *Eunice aphroditois*, from Port Jackson, Enlarged.

Fig. 17. Fully developed foot (somewhat shrivelled in spirit) of *Eunice aphroditois*, from Samboangan, ... Enlarged.

Fig. 18. Thirty-sixth foot of *Eunice torquata*, ... × 18.

Fig. 19. Tenth foot of *Marphysa goodsiri*, ... × 25.

EUNICIDÆ

PLATE XXXIX.

PLATE XXXIX.

Fig. 1. Dorsal aspect of the anterior region of *Eunice elseyi*, . . Enlarged.

Fig. 2. Thirtieth foot of a small specimen of the foregoing, . . × 18.

Fig. 3. Branchia of the twentieth foot of a large example of the same, . × 12.

Fig. 4. Anterior dorsal view of *Nicidon balfouriana*, . . . Enlarged.

Fig. 5. Tenth foot of the foregoing, ... × 40.

Fig. 6. Fiftieth foot of the same, ... × 40.

Fig. 7. Dorsal aspect of the head and anterior region of *Eunice murrayi*, Enlarged.

Fig. 8. Tenth foot of the foregoing, ... × 25.

Fig. 9. Anterior dorsal view of *Eunice mindanavensis*, . . . Enlarged.

Fig. 10. Twentieth foot of the foregoing, ... × 25.

Fig. 11. Foot of fragmentary *Eunice equibranchiata*, ... × 12.

Fig. 12. Nineteenth foot of *Eunice barvicensis*, ... × 18.

Fig. 13. Anterior dorsal region of *Eunice pycnobranchiata*, . . Enlarged.

Fig. 14. Tenth foot of the foregoing, ... × 18.

Fig. 15. Tenth foot of a variety with small branchiæ, . . . × 18.

Fig. 16. Foot of *Eunice bassensis*, ... × 18.

Fig. 17. Thirtieth foot of *Eunice vittata*, ... × 25.

Fig. 18. Twentieth foot of *Eunice vittata*, ... × 50.

Fig. 19. Foot of *Eunice* (fragment) from Bermuda, . . . × 18.

Fig. 20. Anterior dorsal view of *Macduffia bonhardi*, . . . Enlarged.

Fig. 21. Tenth foot of the foregoing, ... × 50.

Fig. 22. Twentieth foot of the same, ... × 50.

EUNICIDÆ.

PLATE XL.

PLATE XL.

Fig. 1. *Hydlinœcia tubicola*, var., inverted in its tube (from Station 320), ... About natural size.

Fig. 2. Sixty-third foot of *Hyalinœcia tubicola*, var. *longibranchiata*, . × 25.

Fig. 3. Anterior dorsal region of *Hyalinœcia benthaliana*, . . Enlarged.

Fig. 4. Anterior dorsal view of *Nothria minuta*, ... Enlarged.

Fig. 5. *Nothria sombreriana*,[1] in a hyaline tube strengthened with large sponge-spicules, ... Enlarged.

Fig. 6. Anterior dorsal view of the same species. The tentacular cirri have been accidentally omitted, ... Enlarged.

Fig. 7. Twentieth foot of the foregoing, ... × 25.

Fig. 8. Anterior dorsal aspect of *Nothria tenuisetis*, . . . Enlarged.

Fig. 9. Thirtieth foot of the foregoing, ... × 25.

Fig. 10. Tube of *Nothria abranchiata*, ... About natural size.

Fig. 11. Head and anterior dorsal region of the same, . . . Enlarged.

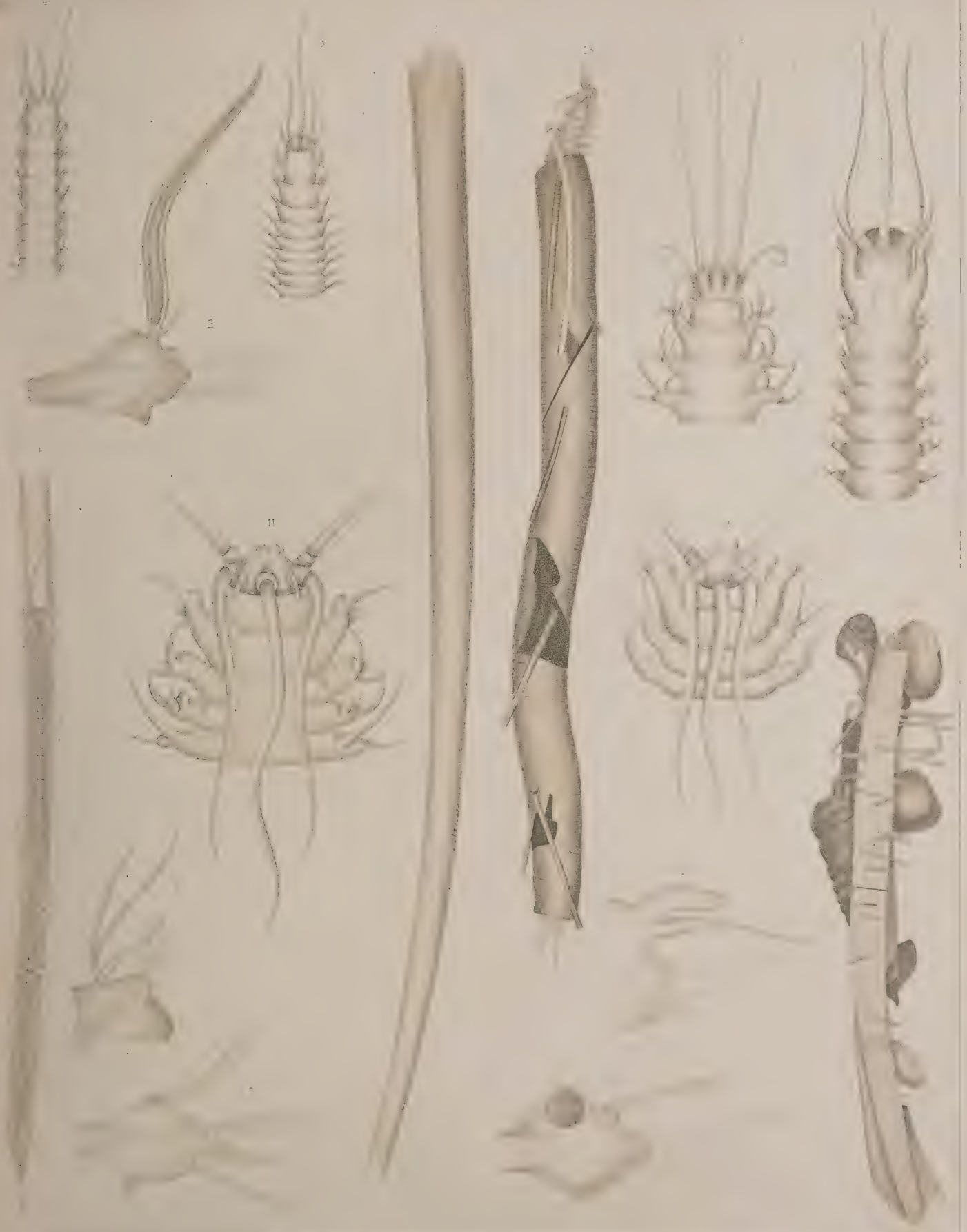
Fig. 12. Thirtieth foot of the foregoing, ... × 25.

Fig. 13. *Nothria pycnobranchiata*, in tube, . . . Slightly enlarged.

Fig. 14. Head and anterior region of the foregoing, . . . Enlarged.

Fig. 15. Posterior foot of the foregoing, indifferently preserved, . . × 25.

[1] The artist has omitted the shading between the tentacles.



ONUPHIDÆ

PLATE XLI.

PLATE XLI.

Fig. 1. Tube of *Nothria macrobranchiata*, strengthened with the linear leaves of a pine, and with the animal projecting anteriorly, ... About natural size.

Fig. 2. Head and anterior region of the foregoing, ... Enlarged.

Fig. 3. Fortieth foot of the same, irregularly contracted in the preparation, × 18.

Fig. 4. Tube of *Nothria willemoesii*, ... Slightly enlarged.

Fig. 5. Spine from the foregoing (tube), ... Enlarged.

Fig. 6. Portion of a spine from the same tube, ... × 80.

Fig. 7. Head and anterior dorsal region of the same species, the palpi being somewhat flattened, ... Enlarged.

Fig. 8. Tenth foot of the same, ... × 18.

Fig. 9. Fiftieth foot of the foregoing, with a parasitic *Loxosoma* on the left, ... × 18.

Fig. 10. Separate branchia of the same species with parasitic *Loxosomæ*, . × 25.

Fig. 11. Head and anterior region of *Nothria armandi*, . . . Enlarged.

Fig. 12. Eleventh foot of the same, ... × 40.

Fig. 13. Twenty-first foot of the foregoing, ... × 40.

ONUPHIDIDÆ.

PLATE XLII.

PLATE XLII.

Fig. 1. Anterior dorsal region of *Nothria ehlersi*, . . . Enlarged.

Fig. 2. Tenth foot of the same, ... × 25.

Fig. 3. Thirtieth foot of the foregoing, ... × 25.

Fig. 4. Foot of *Eone trifida*, ... × 80.

Fig. 5. Thirtieth foot of *Glycera tessellata*, ... × 40.

Fig. 6. Twentieth foot of *Glycera amboinensis*, ... × 80.

Fig. 7. Anterior region of the same, with the proboscis extruded, . × about 12.

Fig. 8. Thirtieth foot of *Glycera sagittariæ*, ... × 40.

Fig. 9. Anterior region of *Glycera lamelliformis*, with the proboscis extruded, ... Slightly enlarged.

Fig. 10. Thirtieth foot of *Glycera lamelliformis*, ... × 15.

Fig. 11. Dorsal view of the anterior region of *Hemipodus magellanicus*, ... Somewhat enlarged.

Fig. 12. Ventral view of the same region in another example, . Similarly enlarged.

Fig. 13. Tenth foot of the same, ... × 25.

Fig. 14. Thirtieth foot of the foregoing, ... × 25.

Fig. 15. One hundred and tenth foot of *Hemipodus magellanicus*, . × 25.

ONUPHIDIDÆ, GLYCERIDÆ &c.

PLATE XLIII.

PLATE XLIII.

Fig. 1. Anterior region of *Aricia platycephala*, ... Enlarged.

Fig. 2. Tenth foot of the foregoing, somewhat imperfect in bristles and otherwise, ... × 25.

Fig. 3. Twentieth foot of the same, ... × 25.

Fig. 4. Anterior dorsal region of *Aricidea fragilis*, . . . Enlarged.

Fig. 5. About the twenty-third foot of the foregoing, . . . × 40.

Fig. 6. Anterior dorsal region of *Scoloplos kerguelensis*, . . . Enlarged.

Fig. 7. Eighth foot of the same, ... × 40.

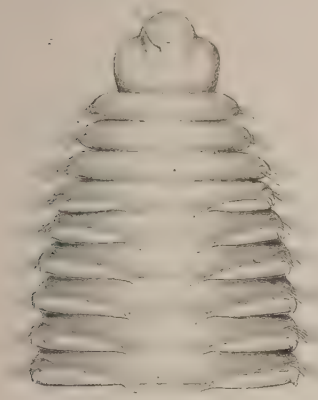
Fig. 8. Twentieth foot of the foregoing, somewhat flattened, . . × 40.

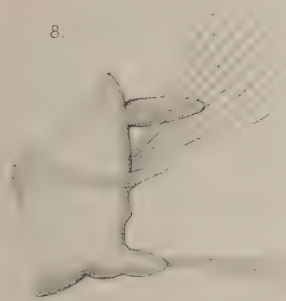
Fig. 9. Anterior dorsal region of *Ammotrypane gracile*, . . . × 18.

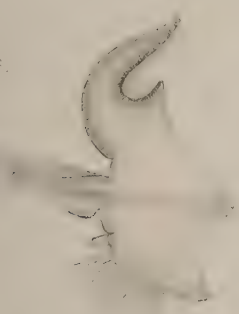
Fig. 10. Posterior end of *Travisia kerguelensis*, ... × 12.

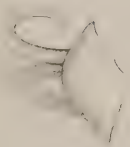
Fig. 11. *Brada mammillata*, ... Enlarged.

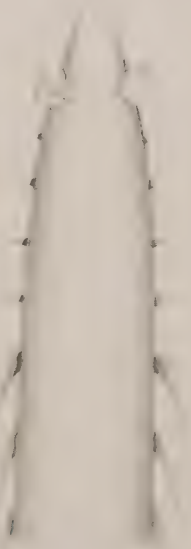
Fig. 12. Tenth foot of *Ammotrypane gracile*, ... × 40.











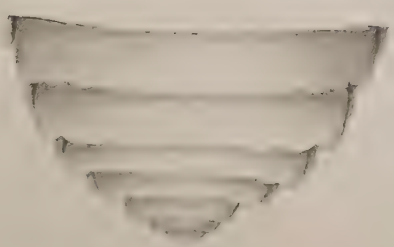


PLATE XLIV.

PLATE XLIV.

Fig. 1. Head and anterior region of *Eumenia reticulata*, from the dorsum, ... × about 12.

Fig. 2. Ventro-lateral view of a portion of a large example of the same, Similarly magnified.

Fig. 3. Anterior end of *Scalibregma inflatum*, var., . . . Enlarged.

Fig. 4. Fortieth foot of the same, ... × 40.

Fig. 5. Head and anterior region of *Ephesia antarctica*, . . × 12.

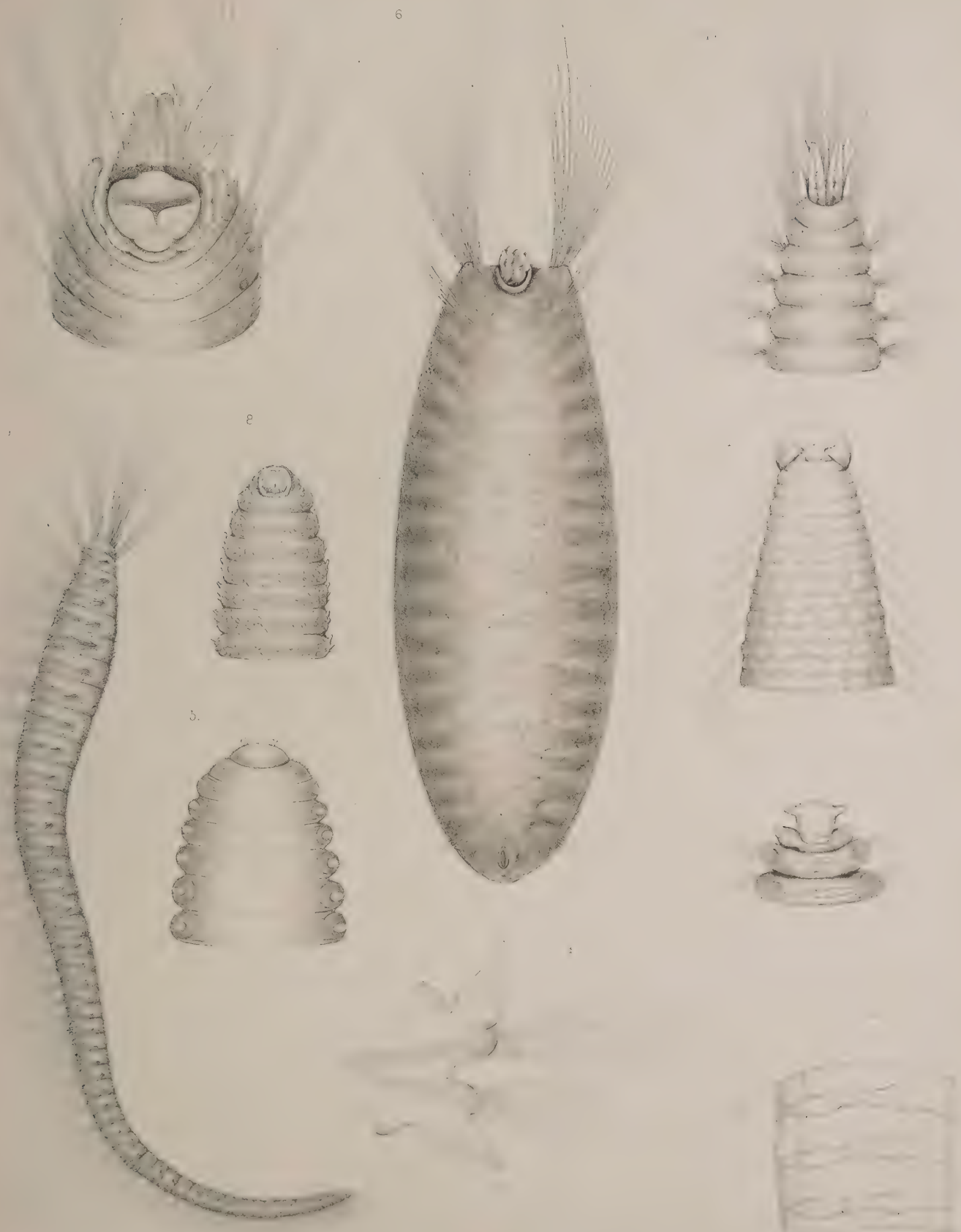
Fig. 6. *Trophonia wyvillei*, ... Somewhat enlarged.

Fig. 7. Anterior end of *Trophonia capensis*, from the ventral surface, . × 12.

Fig. 8. Posterior end of the same, with tip slightly turned upward, . × 12.

Fig. 9. Lateral view of *Trophonia kerguelarum*, . . . Enlarged.

Fig. 10. Anterior end of a small specimen of the same species (ventral surface), ... × 12.



SCALIBREGMIDÆ, CHLORÆMIDÆ &c.

PLATE XLV.

PLATE XLV.

Fig. 1. Anterior end of *Buskiella abyssorum.* The snout is seen from the dorsum, the rest is partly turned round so as to present a lateral view. The specimen is somewhat softened, . . Enlarged.

Fig. 2. Anterior nervous ganglia of the foregoing. The bifid region embraces the snout, ... × 12.

Fig. 3. Dorsal surface of the anterior region of *Brada whiteavesii,* . × 12.

Fig. 4. Ventral surface of the same region, ... × 12.

Fig. 5. Dorsal view of the head and anterior region of *Scolecolepis cirrata,* var., from Sombrero and St. Thomas, ... × 12.

Fig. 6. Ventral surface of the same, ... × 12.

Fig. 7. First (left) branchial process of *Prionospio capensis.* Somewhat compressed, ... × 24.

Fig. 8. Dorsal view of the anterior region of *Chætozone atlantica,* . Enlarged.

Fig. 9. Tip of the tail of *Phyllochætopterus claparedii.* Viewed from the ventral surface, ... Enlarged.

Fig. 10. Tube of the foregoing species. The dark shading inferiorly indicates the muddy deposits at the bottom, while 10*a* is an outline of the diaphragm, ... About natural size.

Fig. 11. A tube of the same species in which repair has occurred, the former torn end projecting to the right as a broad spur, . . Natural size.

Fig. 12. Whorled tube occurring with the foregoing, . . Slightly enlarged.

Fig. 13. Lateral view of three segments of *Dasybranchus* sp., from Yedo, Japan, ... Enlarged.

Fig. 14. Ventral view of three segments of the same, . . . Enlarged.

CHLORÆMIDÆ, CHÆTOPTERIDÆ, SPIONIDÆ &c.

PLATE XLVI.

PLATE XLVI.[1]

Fig. 1. Anterior region of *Phyllochætopterus claparedii*. The specimen has been removed from a tube. All are imperfectly preserved, ... Enlarged.

Fig. 2. Lateral view of the anterior end of *Notomastus*. Station 149, . Enlarged.

Fig. 3. Lateral view of *Notomastus agassizii*, ... Enlarged.

Fig. 4. Anterior region of *Nicomache capensis*. Viewed laterally, . Enlarged.

Fig. 5. Anterior end of *Nicomache japonica*, ... Enlarged.

Fig. 6. Anterior region of *Praxilla köllikeri*, ... Enlarged.

Fig. 7. Lateral view of the head and anterior segments of *Praxilla kerguelensis*. The proboscis is extruded, . . . Enlarged.

Fig. 8. Terminal cup of *Nicomache* (?) *benthaliana*. The front teeth are viewed obliquely, ... Enlarged.

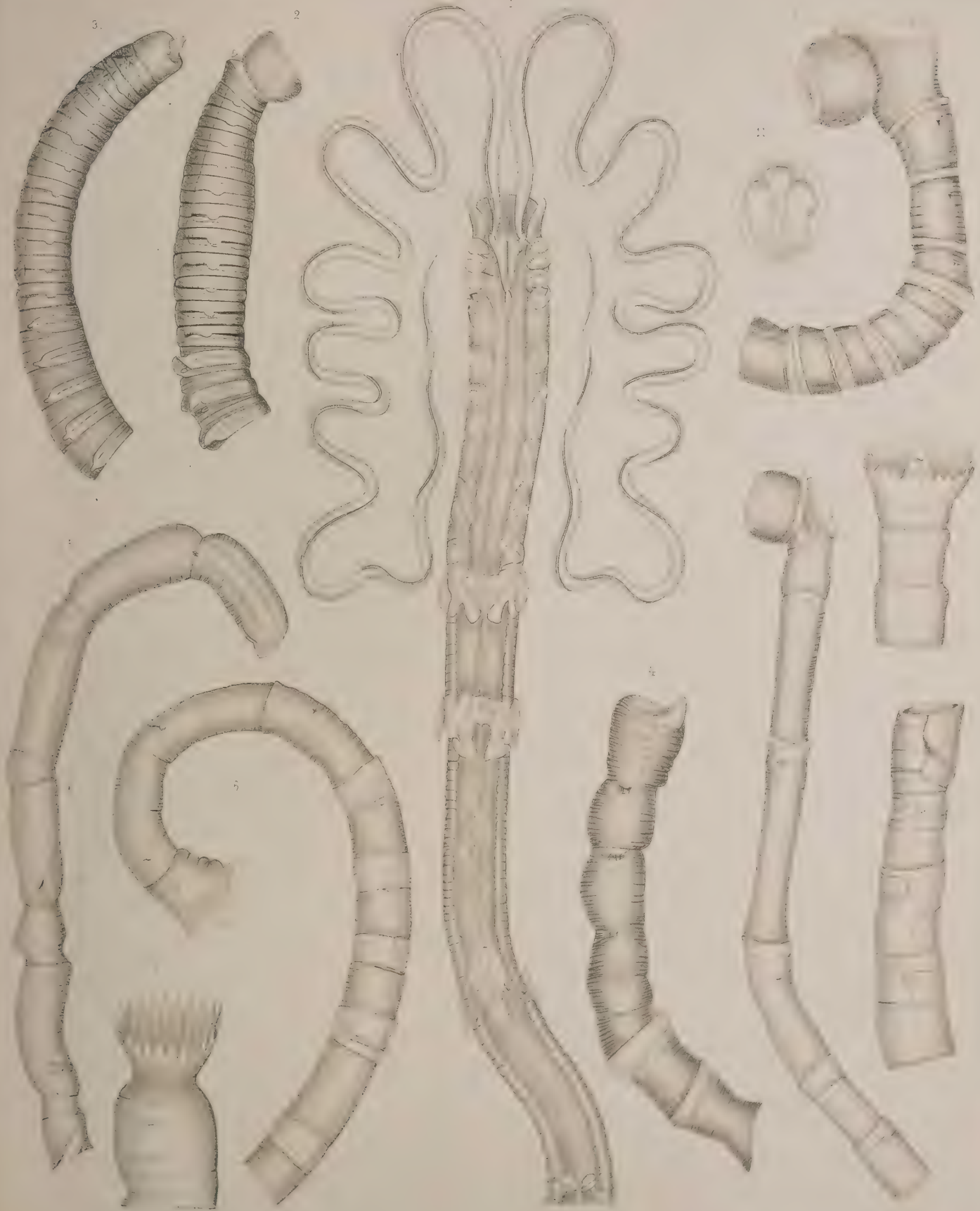
Fig. 9. Lateral view of the head and anterior region of *Praxilla assimilis*, Enlarged.

Fig. 10. Head and anterior region of *Praxilla abyssorum*, . . Enlarged.

Fig. 11. Anterior view of the snout of the same, ... Enlarged.

Fig. 12. Terminal cup of *Maldanella valparaisiensis*, . . . Enlarged.

[1] It is well to remember that all the specimens were removed from tubes after the distribution of the collections made by the Expedition.



CHÆTOPTERIDÆ, HALELMINTHIDÆ & MALDANIDÆ.

PLATE XLVII.

PLATE XLVII.

Fig. 1. Lateral view of the anterior end of *Maldanella antarctica*, Nearly natural size.

Fig. 2. Anterior surface of the snout of the same, . . . Somewhat enlarged.

Fig. 3. Anterior region of *Maldanella valparaisiensis*. From the ventral surface, ... Slightly enlarged.

Fig. 4. Lateral aspect of the anterior region of *Maldanella neo-zealaniæ*, Enlarged.

Fig. 5. Anterior end of *Sabellaria* (*Pallasia*) *johnstoni*. From the dorsal aspect, ... Enlarged.

Fig. 6. Lateral view of the same region,[1] . . . . Enlarged.

Fig. 7. Lateral view of the anterior extremity of *Sabellaria* (*Pallasia*) *australiensis*, ... Enlarged.

Fig. 8. Anterior region of *Petta assimilis*. From the ventral surface, . Enlarged.

Fig. 9. Posterior end of the same. From the dorsal aspect, Still further enlarged.

Fig. 10. Dorsal view of the anterior region of *Ampharete kerguelensis*, . Enlarged.

Fig. 11. Anterior dorsal view of *Phyllocomus croceus*, . . . Enlarged.

Fig. 12. Anterior end of *Amphicteis sarsi*. The specimen is softened and imperfect, but the proportional length of the bristles is indicated, ... Enlarged.

[1] The curvature of certain of the anterior bristles is an idea of the engraver.

MALDANIDÆ, HERMELLIDÆ & AMPHICTENIDÆ.

PLATE XLVIII.

PLATE XLVIII.

Fig. 1. Dorsal view of the anterior region of *Grubianella antarctica*, somewhat compressed by the tube from which it was removed. The left branchiæ are absent, ... Enlarged.

Fig. 2. Posterior end of the same species, ... Enlarged.

Fig. 3. Anterior region of *Samythopsis grubei*. From the dorsal aspect, . Enlarged.

Fig. 4. Lateral aspect of the anterior region of *Eusamytha pacifica*, . Enlarged.

Fig. 5. Dorsal view of the anterior region of *Melinna armandi*, . . Enlarged.

Fig. 6. Anterior region of *Melinna pacifica*. From the dorsum, . Enlarged.

Fig. 7. Anterior view of the snout of *Amphitrite kerguelensis*, . . Enlarged.

Fig. 8. Lateral aspect of the anterior region of *Lanassa benthaliana*, ... Enlarged under a lens.

Fig. 9. Lateral view of the anterior end of *Leæna antarctica*, . . Enlarged.

Fig. 10. Extremity of the tail of the foregoing, ... Enlarged.

Fig. 11. Lateral view of the anterior extremity of *Pista corrientis*. The specimen is injured, ... Enlaregd.

AMPHICTENIDÆ & TEREBELLIDÆ

PLATE XLIX.

PLATE XLIX.

Fig. 1. *Amphitrite kerguelensis*, viewed laterally. The middle of the body is enclosed in a massive tube of fine mud, . . . Enlarged.

Fig. 2. Lateral view of the anterior region of *Terebella grubei*, . . Enlarged.

Fig. 3. Anterior region of *Terebella* (*Lanice*) *flabellum*. From the lateral aspect, ... Enlarged.

Fig. 4. Free or upper extremity of the tube of *Terebella* (*Lanice*) *seticornis*, ... Enlarged.

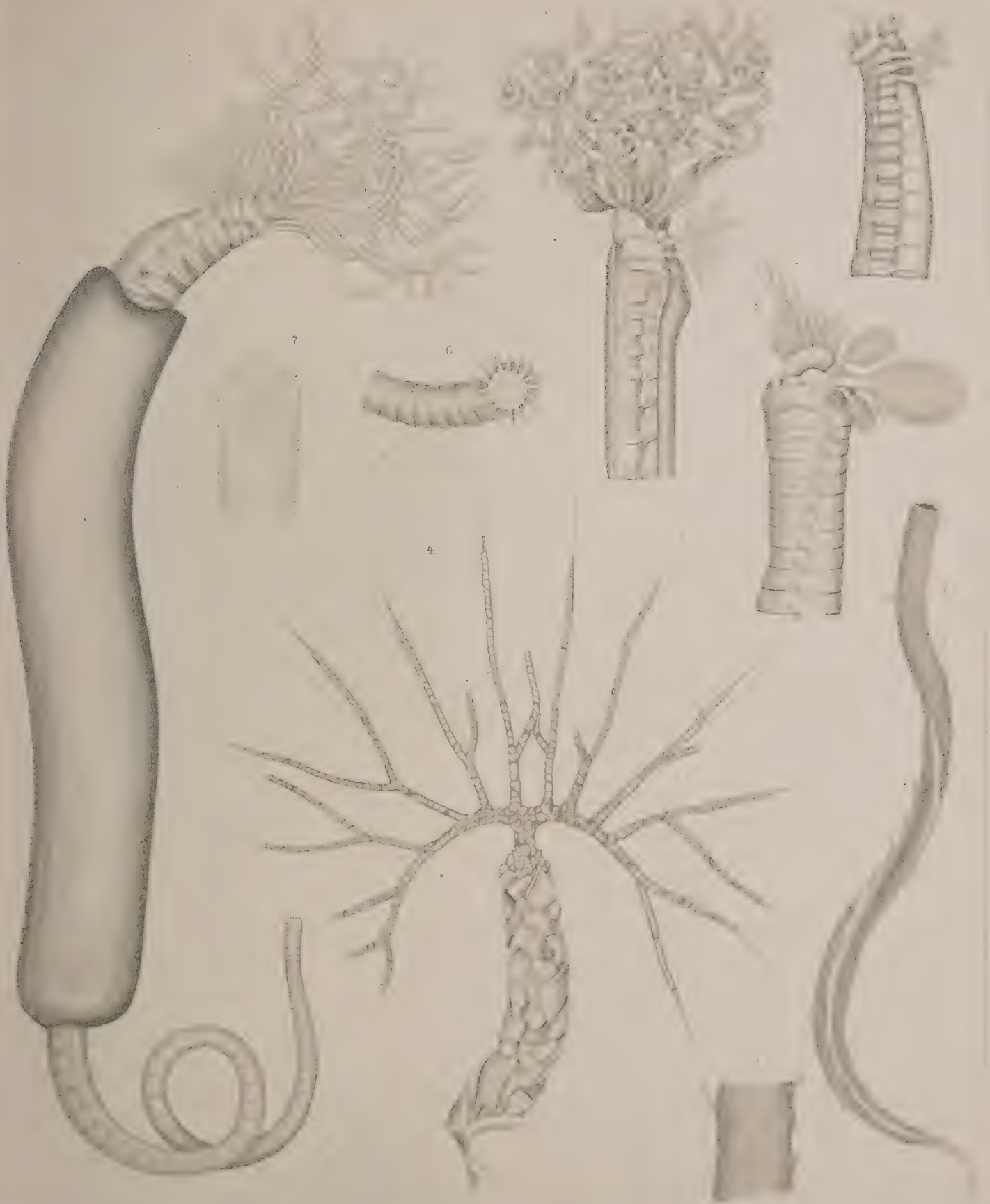
Fig. 5. Lateral aspect of the anterior region of *Pista fasciata*, Grube. The tentacles have been abbreviated, ... Enlarged.

Fig. 6. Tip of the tail of *Eupista grubei*, with the anal funnel bent upward, ... Enlarged.

Fig. 7. Outline of the anterior region of the same. The specimen is so decayed that only a remembrance is attempted, . . Enlarged.

Fig. 8. Remarkable tube with longitudinal and somewhat spiral spinous ridges. It is chiefly composed of mud, . . Not much enlarged.

Fig. 9. Fragment of the same more highly magnified, showing the scale-like arrangement of the mud.



TEREBELLIDÆ.

PLATE L.

PLATE L.

Fig. 1. Tube of *Terebella* (*Lanice*) *flabellum*, with its finely branched anterior end. It is attached to a *Terebratula* from 150 fathoms, off Prince Edward Island, . . . Somewhat enlarged.

Fig. 2. The anterior region of *Eupista darwini*. From the dorsal aspect. The specimen was removed from a tube, and is softened, . Enlarged.

Fig. 3. Ventral aspect of the same region of the foregoing, . . Enlarged.

Fig. 4. Tube of *Euthelepus setubalensis*, mostly composed of sponge-spicules, ... Enlarged.

PLATE LI.

PLATE LI.

Fig. 1. Anterior region of *Pista mirabilis*, viewed laterally, . . Enlarged.

Fig. 2. Tube of the foregoing, ... Slightly enlarged.

Fig. 3. Anterior region of *Leæna neo-zealaniæ*, viewed from the dorsum. The specimen is much injured, ... Enlarged.

Fig. 4. Dorsal view of the anterior region of *Euthelepus chilensis*, . . Enlarged.

Fig. 5. Ventral view of the same region, ... Enlarged.

Fig. 6. *Artacama challengeriæ*. From the lateral aspect, . . Enlarged.

Fig. 7. Anterior lateral region of *Artacama zebuensis*, . . . Enlarged.

Fig. 8. Lateral view of *Terebellides ehlersi*, ... Enlarged.

TEREBELLIDÆ

PLATE LII.

PLATE LII.

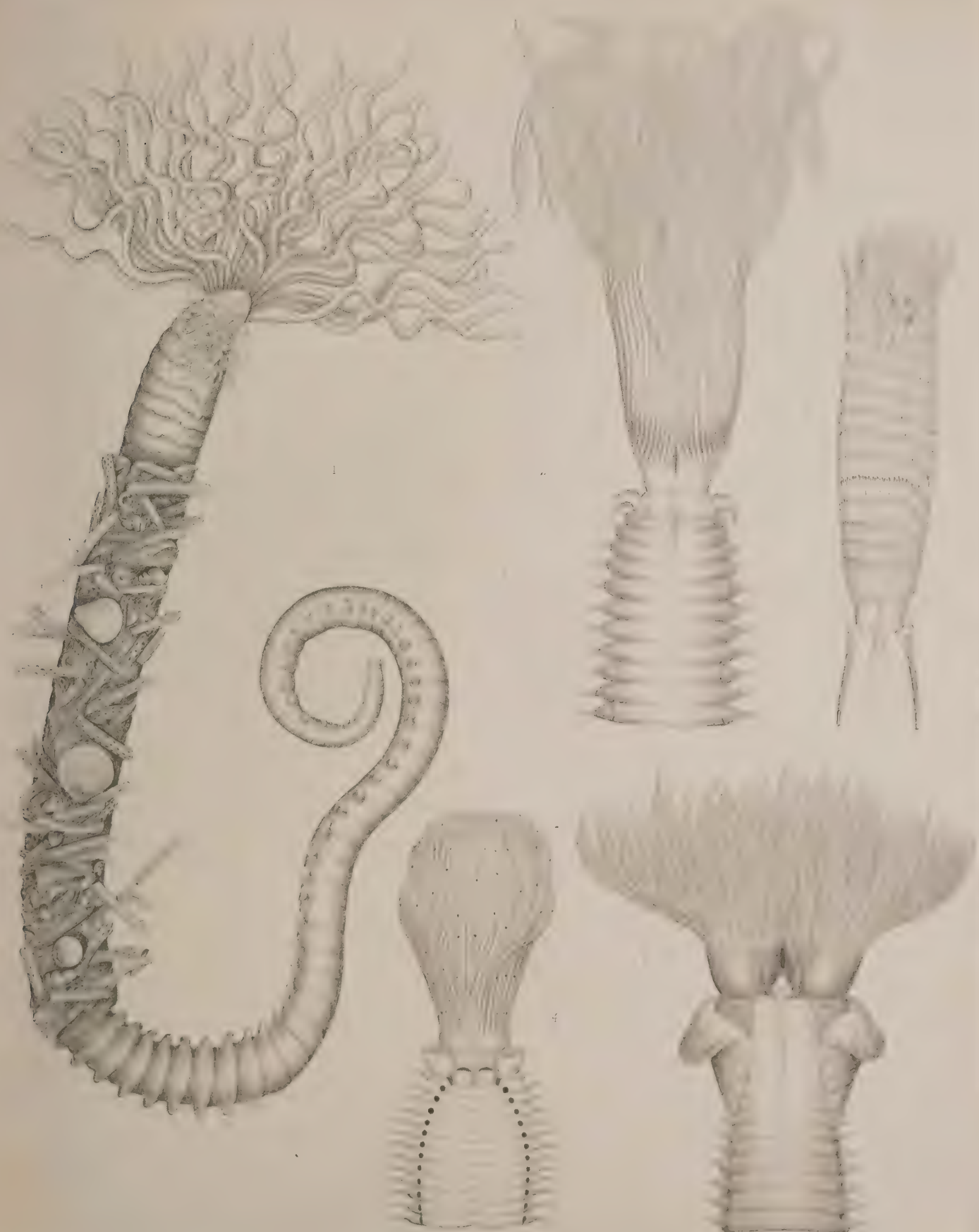
Fig. 1, *Neottis antarctica.* A portion of the tube—composed of *Salicornaria,* shells, and other organisms—covers the median region, ... Enlarged.

Fig. 2. Dorsal aspect of the anterior region of *Sabella zebuensis.* The branchiæ are softened, ... Enlarged.

Fig. 3. Dorsal view of the anterior region of *Sabella fusca,* . . Enlarged.

Fig. 4. Anterior dorsal region of *Sabella bipunctata,* . . . Enlarged.

Fig. 5. Anterior dorsal region of *Dasychone orientalis* removed from its tube, ... Enlarged.



TEREBELLIDÆ & SABELLIDÆ

PLATE LIII.

PLATE LIII.

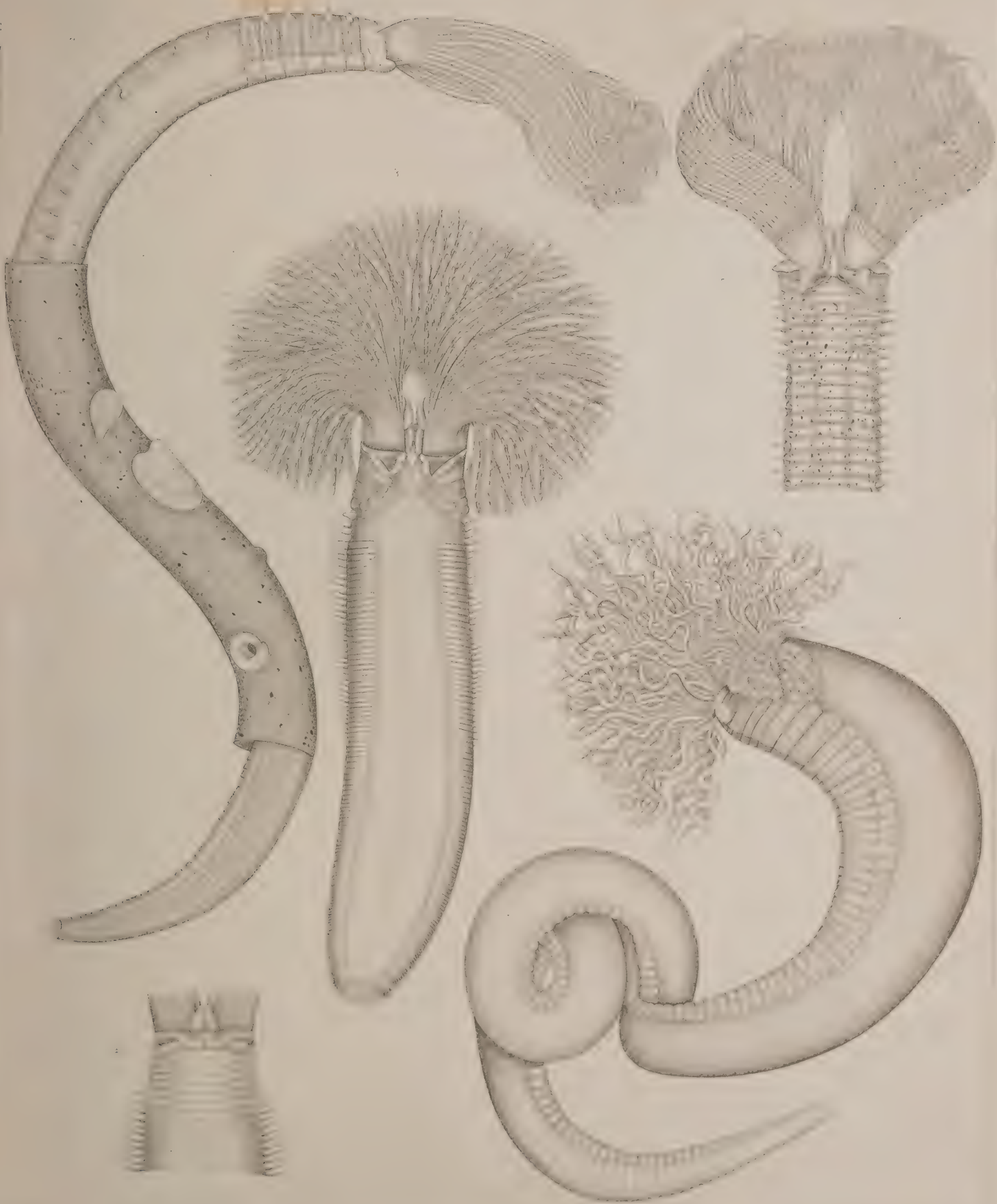
Fig. 1. Lateral view of *Schmardanella pterochæta*, . . . Enlarged.

Fig. 2. Lateral view of *Potamilla torelli*. A portion of the tube—composed of sand-grains, with a few adherent shells—remains on the middle of the body, ... Enlarged.

Fig. 3. *Dasychone violacea*. From the dorsal aspect, . . . Enlarged.

Fig. 4. Anterior ventral region of the same, ... Enlarged.

Fig. 5. Dorsal view of the anterior region of *Dasychone nigro-maculata*, . Enlarged.



TEREBELLIDÆ & SABELLIDÆ

PLATE LIV.

PLATE LIV.

Fig. 1. Anterior ventral aspect of *Dasychone capensis*, . . . Enlarged.

Fig. 2. Dorsal view of *Protula capensis*, ... Enlarged.

Fig. 3. *Protula americana*, and tube, ... Enlarged.

Fig. 4. *Apomatus elisabethæ*. From the lateral aspect, . . . Enlarged.

Fig. 5. Tube of *Serpula narconensis*, ... Slightly enlarged.

Fig. 6. Tube of *Ditrypa arietina*, ... Enlarged.

Fig. 7. Tube of *Serpula philippensis*, ... Enlarged.

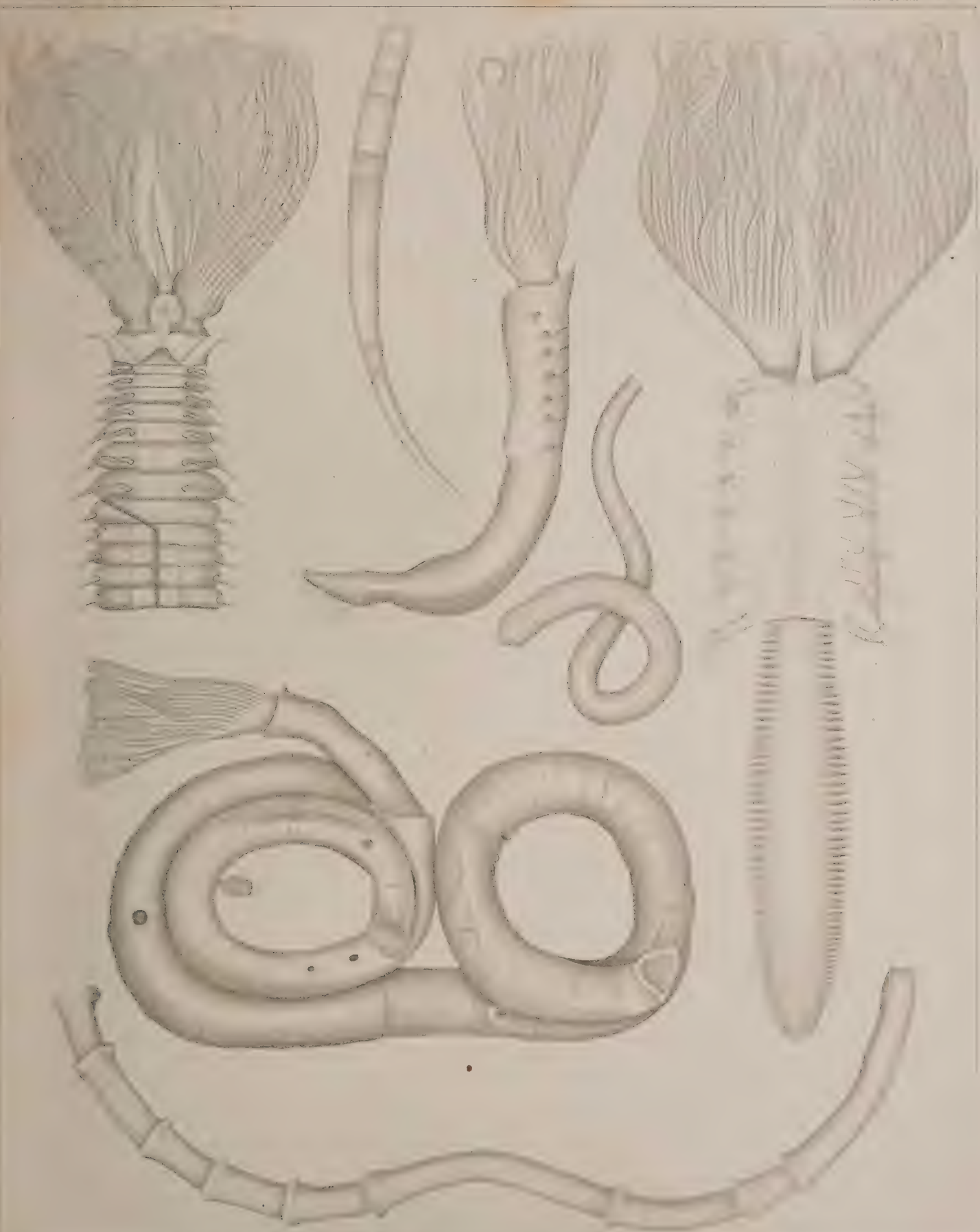


PLATE LV.

PLATE LV.

Fig. 1 Anterior region of *Serpula narconensis*, viewed from the right side, Enlarged.

Fig. 2. Tubes and anterior end of *Serpula narconensis*, var. *magellanica*. The rounded bodies attached to the tubes are Ascidians, . Enlarged.

Fig. 3. Operculum of *Pomatocerus strigiceps*, showing three tiers, . Enlarged.

Fig. 4. Anterior region of another example of the same species, with only a single plate in the operculum, . . . Enlarged.

Fig. 5. Portion of the tube of *Placostegus ornatus*, . . . Enlarged.

Fig. 6. Branchiæ and operculum of the foregoing, . . . Enlarged.

Fig. 7. Portion of the tube of *Placostegus benthalianus*, . . . Enlarged.

Fig. 8. Fragment of the tube with branchiæ and operculum of *Placostegus mörchii*, ... Enlarged.

Fig. 9. Anterior region of the tube with the operculum and the tips of branchiæ of *Placostegus assimilis*, . . . Enlarged.

Fig. 10. Operculum of *Spirobranchus occidentalis*, . . . Enlarged.

SERPULIDÆ

PLATE 1A.

PLATE Ia.

Fig. 1. Dorsal bristle of *Euphrosyne capensis*, ... × 350.

Fig. 2. Dorsal bristle of *Euphrosyne capensis*, at the inner or dorsal edge of the row, ... × 350.

Fig. 3. Ventral bristle of the same species, ... × 350.

Fig. 4. Dorsal serrated and forked bristle of *Euphrosyne borealis*, . × 350.

Figs. 5, 6. Varieties in the ventral bristles of the foregoing, . . . × 350.

Fig. 7. Long serrated dorsal bristles of *Chloeia flava*, . . . × 210.

Fig. 8. Anterior dorsal bristle of the same form, with a smooth tip, . × 210.

Fig. 9. Ventral bristle of the same, ... × 350.

Fig. 10. Tip of a boldly serrated dorsal bristle of *Chloena atlantica*, beyond the fork, ... × 350.

Fig. 11. Tip of another dorsal bristle from the same species, showing slighter serrations, ... × 350.

Fig. 12. Third kind of dorsal bristle of the foregoing, with a well-marked fork and smooth surface, ... × 210.

Fig. 13. Ventral bristle of the same species. From the middle of the body, 350.

Fig. 14. Long slender bristle. From the dorsal tuft of *Chloeia fusca*, . × 350.

Fig. 15. Ventral bristle (average form). From an anterior foot of same species, ... × 350.

Fig. 16. Fragment of one of the longer roughened or spinous dorsal bristles of *Amphinome rostrata*, ... × 350.

EUPHROSYNIDÆ & AMPHINOMIDÆ

PLATE IIA.

PLATE IIA.

Fig. 1. Tip of one of the second kind of dorsal bristles of *Chloeia fusca*, . × 350.

Fig. 2. Tip of one of the third kind of dorsal bristles in the same species. It is tinted of a deep yellow colour, ... × 350.

Fig. 3. One of the smoother dorsal bristles (having three faint serrations). From the anterior third of *Notopygos megalops*, . . × 350.

Fig. 4. Average ventral bristle of the same, ... × 350.

Fig. 5. Large pale greenish dorsal bristle of *Notopygos labiatus*, . . × 90.

Fig. 6. Tip of an average ventral bristle of the same form, . . × 90.

Fig. 7. Dorsal bristle of *Chloeia* (from "Porcupine"), . . . × 350.

Fig. 8. Stouter form of dorsal bristle of *Amphinome rostrata*, . . × 350.

Fig. 9. One of the longer dorsal bristles in the same form, . . × 210.

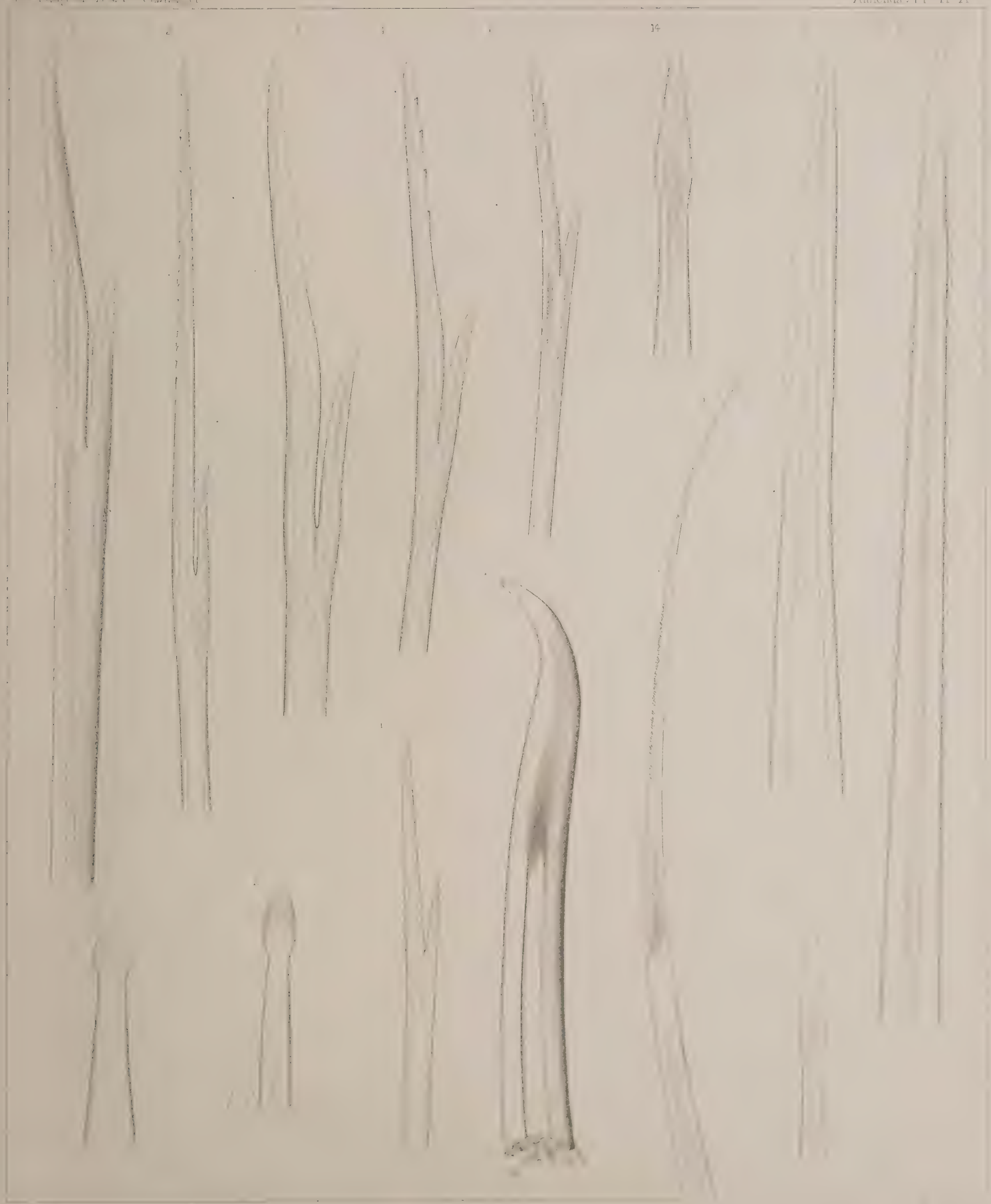
Fig. 10. Ventral bristle of the preceding species, ... × 90.

Fig. 11. Tip of the spine of the dorsal division of the foot of the same, . × 350.

Fig. 12. Tip of the spine of the ventral division of the foot in the foregoing, × 350.

Fig. 13. Stout simple hastate spine in the ventral series of *Eurythoë pacifica*, ... × 350.

Fig. 14. Stout simple hastate bristle in the ventral series of *Eurythoë pacifica*, var. *levukaensis*, ... × 350.



AMPHINOMIDÆ

PLATE IIIA.

PLATE IIIA.

Fig. 1. Simple slender dorsal bristle, minutely roughened toward the tip, of *Hermodice carunculata*, ... × 350.

Fig. 2. One of the stouter serrated dorsal bristles of the same, . . × 350.

Fig. 3. One of the upper series of ventral bristles of the foregoing, with a more elongated tip, ... × 350.

Fig. 4. A stouter ventral bristle of the same species, . . . × 350.

Fig. 5. Simple, slightly curved bristle of *Eurythoë pacifica*, . . × 350.

Fig. 6. One of the elongated slightly bifid dorsal bristles of the same, . × 350.

Fig. 7. Third kind (stout serrated) of dorsal bristle of the foregoing, . × 350.

Fig. 8. A long (superior) bifid ventral bristle of the same, with a finely serrated inner margin, ... × 350.

Fig. 9. One of the stouter ventral bristles of the preceding, having only three or four serrations near the tip, . . . × 350.

Fig. 10. Elongated translucent bifid bristle of *Eurythoë pacifica*, var. *levukaensis*, ... × 350.

Fig. 11. Stout serrated dorsal bristle of the same, ... × 350.

Fig. 12. Ventral bristle (of medium size) from the anterior third of the foregoing species, ... × 350.

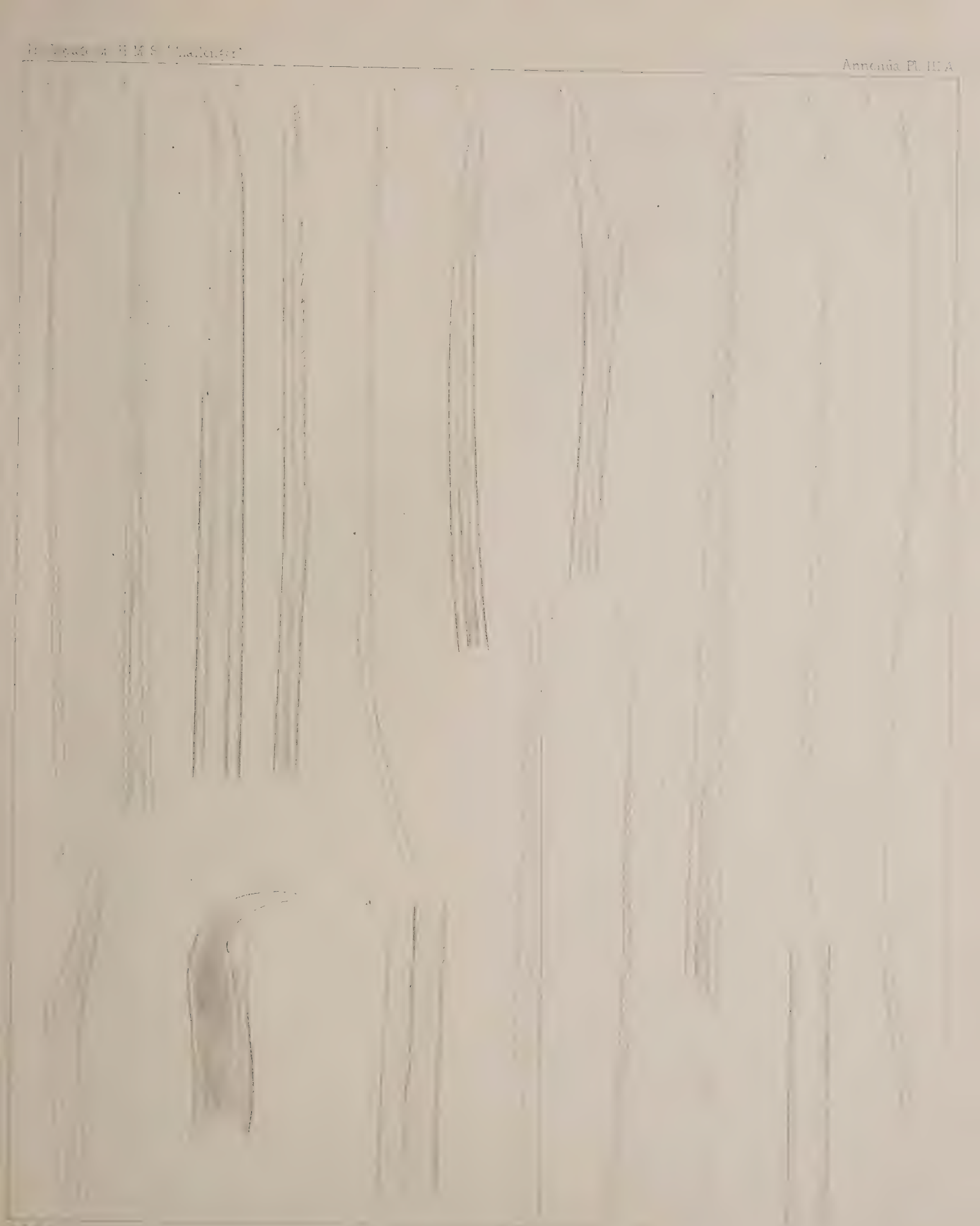
Fig. 13. Simple translucent dorsal bristle of *Hipponoë gaudichaudi*, . × 350.

Fig. 14. Bifid tip of one of the foregoing, ... × 700.

Fig. 15. Normal appearance of the lower part of the shaft of the same kind of bristle, only a slight roughness along the edge indicating the points, ... × 700.

Fig. 16. A compressed (and fissured) shaft of the same form, with more distinct indications of the points or serratures, . . × 700.

Fig. 17. Bifid ventral hook of the preceding species, . . . × 350.



AMPHINOMIDÆ

PLATE IVA.

PLATE IVA.

Fig. 1. Bristles from the ventral group of the first foot of *Lætmonice producta*, ... × 350.

Fig. 2. One of the stouter superior bristles showing minute chitinous nodules. From the second foot of the same, . . . × 350.

Fig. 3. Serrated bristle from the upper division of the ventral branch of the second foot in the same form, ... × 90.

Fig. 4. Spinose bristle from the lower division of the ventral branch of the second foot of the preceding, ... × 90.

Fig. 5. Tip of one of the lustrous brown dorsal spines (of medium size) of the same species, ... × 90.

Fig. 6. One of the same with the chitinous sheaths or guards from the ninth foot, ... × 90.

Fig. 7. Tip of a spine showing an alternate arrangement of the recurved teeth from the same species, ... × 55.

Fig. 8. Tip of one of the fully formed ventral bristles of the foregoing, . × 55.

Fig. 9. Tip of one of the dark brown dorsal spines of *Lætmonice producta*, var. *wyvillei*, ... × 90.

Fig. 10. Tip of one of the ventral bristles of the same form, . . × 55.

Fig. 11. Portion of the distal region of one of the simple inner dorsal bristles of the same, showing the nodes, which are better marked than in *Lætmonice producta* proper, . . . × 350.

Fig. 12. Portion of one of the fine dorsal bristles overlapping the scales of *Lætmonice producta*, var. *benthaliana*, . . . × 350.

Fig. 13. Portion of the shaft (a short distance below that figured in Pl. VA. fig. 10) of one of the dorsal spines of *Lætmonice japonica*, . × 90.

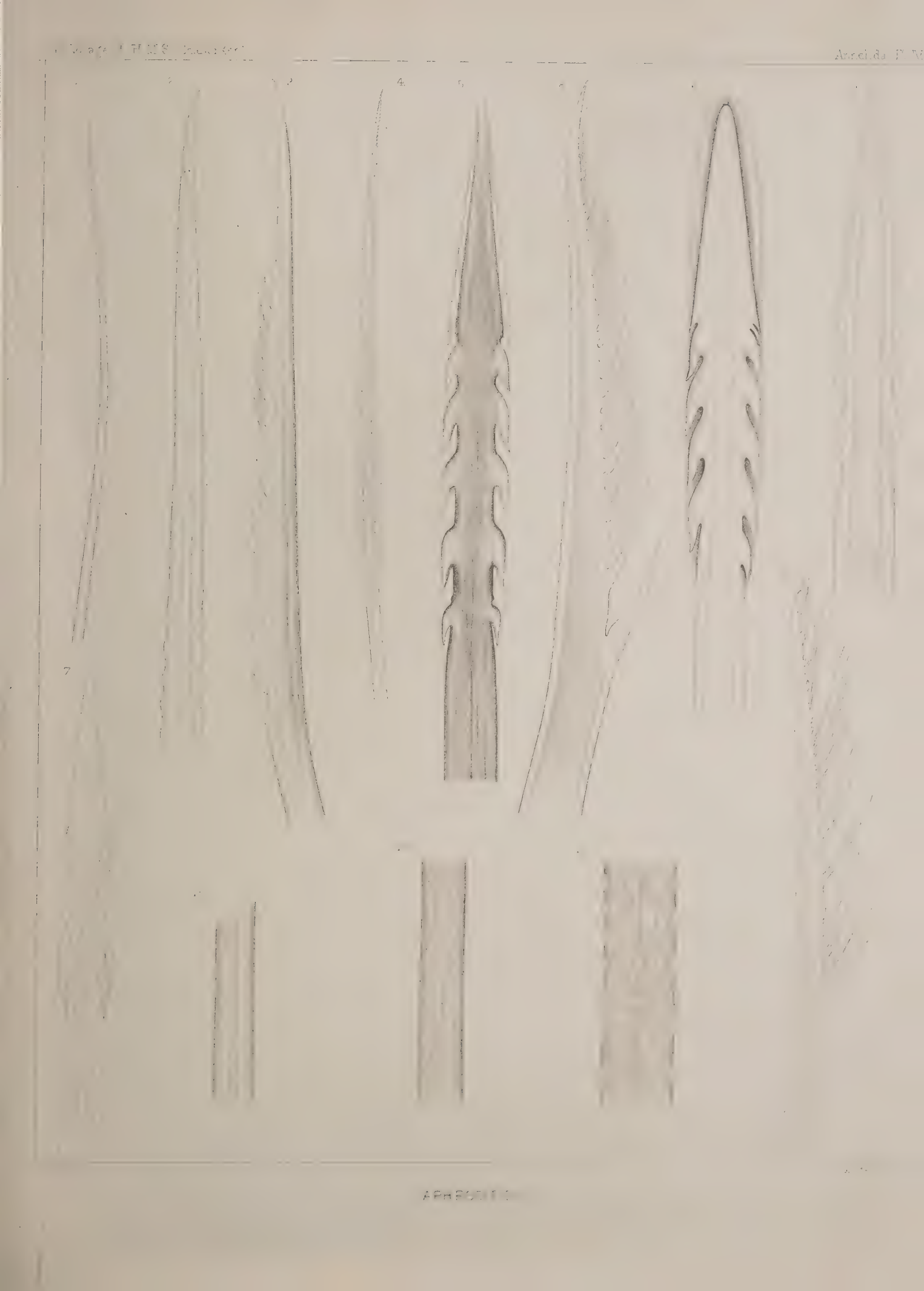


PLATE Va.

PLATE Va.

Fig. 1. Tip of one of the great dorsal spines of *Lætmonice producta*, var. *benthaliana*, ... × 90.

Fig. 2. Tip of a ventral bristle from the same form, ... × 55.

Fig. 3. Tip of a short (developing?) spine from the posterior third of *Lætmonice producta*, var. *willemoesii*, ... × 90.

Fig. 4. Ventral bristle of the same species, ... × 55.

Fig. 5. Tip of a dorsal spine of *Lætmonice producta*, var. *assimilis*, . × 90.

Fig. 6. A more extensive view of the tip of one of the spines, so as to demonstrate the terminal curves, ... × 55.

Fig. 7. A similar view of the organ in *Lætmonice filicornis*, from Shetland. The contrast in the curves is evident, ... × 55.

Fig. 8. Tip of a ventral bristle of *Lætmonice producta*, var. *assimilis*, . × 90.

Fig. 9. Tip of a ventral bristle of *Lætmonice japonica*, . . × 55.

Fig. 10. Tip of a dorsal spine of the same species, ... × 90.

Fig. 11. Extremity of one of the very fine hairs forming the "felt" of *Lætmonice aphroditoides*, ... × 350.

Fig. 12. Tip of one of the lustrous brown dorsal spines of this form, . × 55.

Fig. 13. Ventral bristle of the same species, showing the "hairy" condition of the tip, ... × 55.

Fig. 14. Tip of one of the minute serrate bristles from the anterior feet of the same species, ... × 350.

Fig. 15. Extremity of one of the stout brownish spines from the same region of the body, ... × 90.

PLATE VIA.

PLATE VIa.

Fig. 1. Tip of a ventral bristle of *Aphrodita intermedia*, ... × 210.

Fig. 2. Dorsal spine of *Aphrodita echidna*, ... × 18.

Fig. 3. Tip of one of the lower ventral bristles of the same species, . × 210.

Fig. 4. Tip of a light bronze-coloured dorsal spine of *Aphrodita australis*, × 210.

Fig. 5. Tip of one of the inner dorsal bristles (which curve inward amongst the felt), ... × 350.

Fig. 6. Tip of one of the smaller inferior ventral bristles of the same species, × 102.

Fig. 7. Extremity of one of the dart-shaped anterior ventral bristles, the tip being broken, ... × 350.

Fig. 8. Spinose dorsal bristle of *Palmyra aurifera*, . . . × 50.

Fig. 9. Ventral bristle of the same, ... × 210.

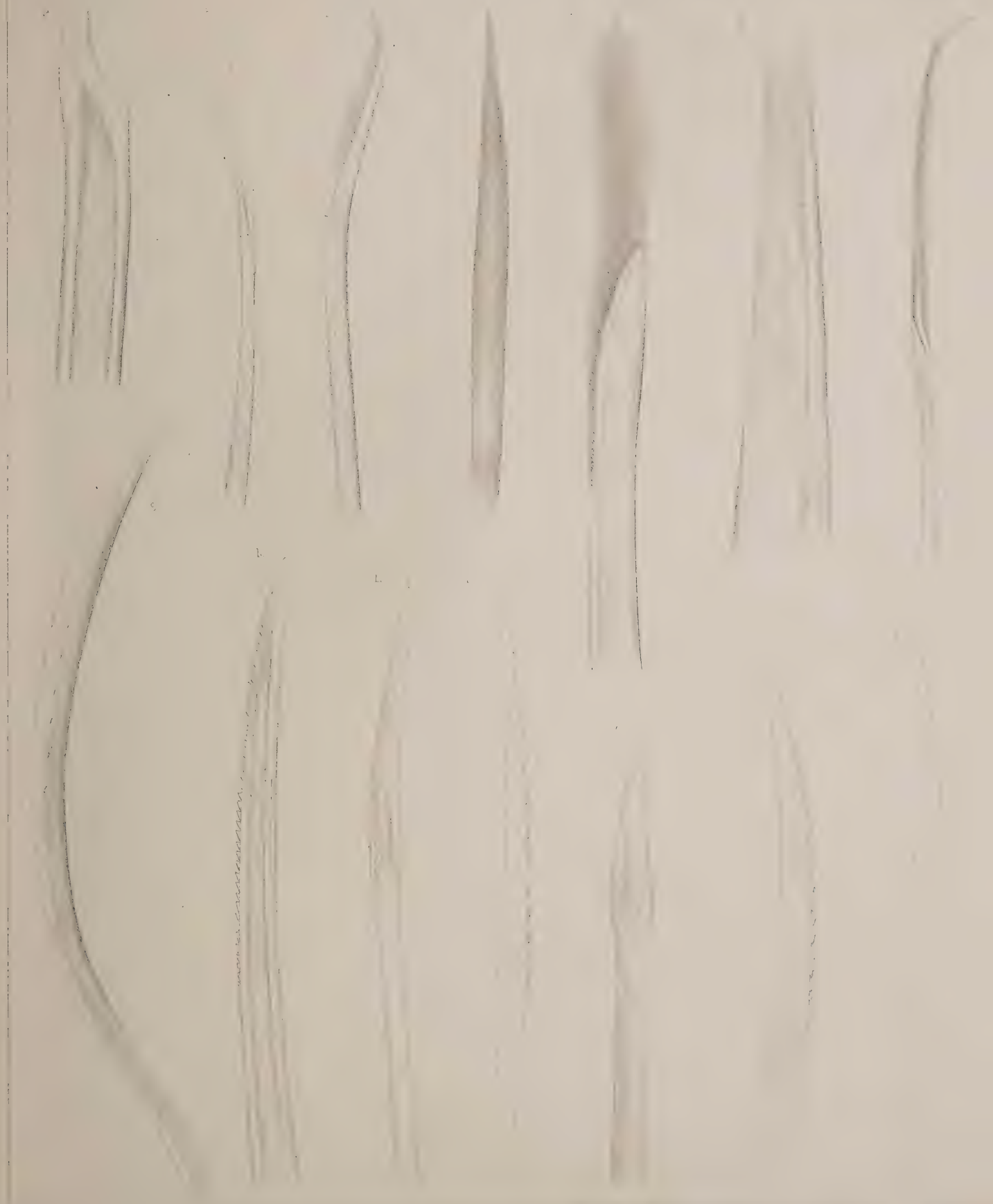
Fig. 10. Dorsal bristle of *Lagisca antarctica* in Farrant's solution, . . × 90.

Fig. 11. Ventral bristle of the same, ... × 90.

Fig. 12. Dorsal bristle of *Evarne kerguelensis*, ... × 210.

Fig. 13. Superior ventral bristle of the same, slightly turned round, and showing a trace of a secondary process, . . . × 210.

Fig. 14. One of the series having shorter tips from the middle of the ventral tuft in the foregoing species, ... × 210.



APHRODITIDÆ & POLYNOIDÆ.

PLATE VIIA.

PLATE VIIA.

Fig. 1. Average dorsal bristle of *Lagisca magellanica*, ... × 90.

Fig. 2. Ventral bristle of the same (from the middle of the series), . × 90.

Fig. 3. Tip of average dorsal bristle of *Eulagisca corrientis*, . . × 90.

Fig. 4. Bristle from the middle of the ventral tuft of the same form, . × 90.

Fig. 5. Average dorsal bristle of *Lagisca tenuisetis*, . . . × 400.

Fig 6. Tip of one of the large forms from the same tuft, ... × 400.

Figs. 7, 8. Superior ventral bristles of the same species, . . . × 400

Fig. 9. Bristle with shorter tip, from the middle of the ventral series of the same, ... × 400.

Fig. 10. Tip of a dorsal bristle of *Lagisca peracuta*, . . . × 350.

Fig. 11. Extremity of one of the middle bristles of the ventral series of the same species, ... × 350.

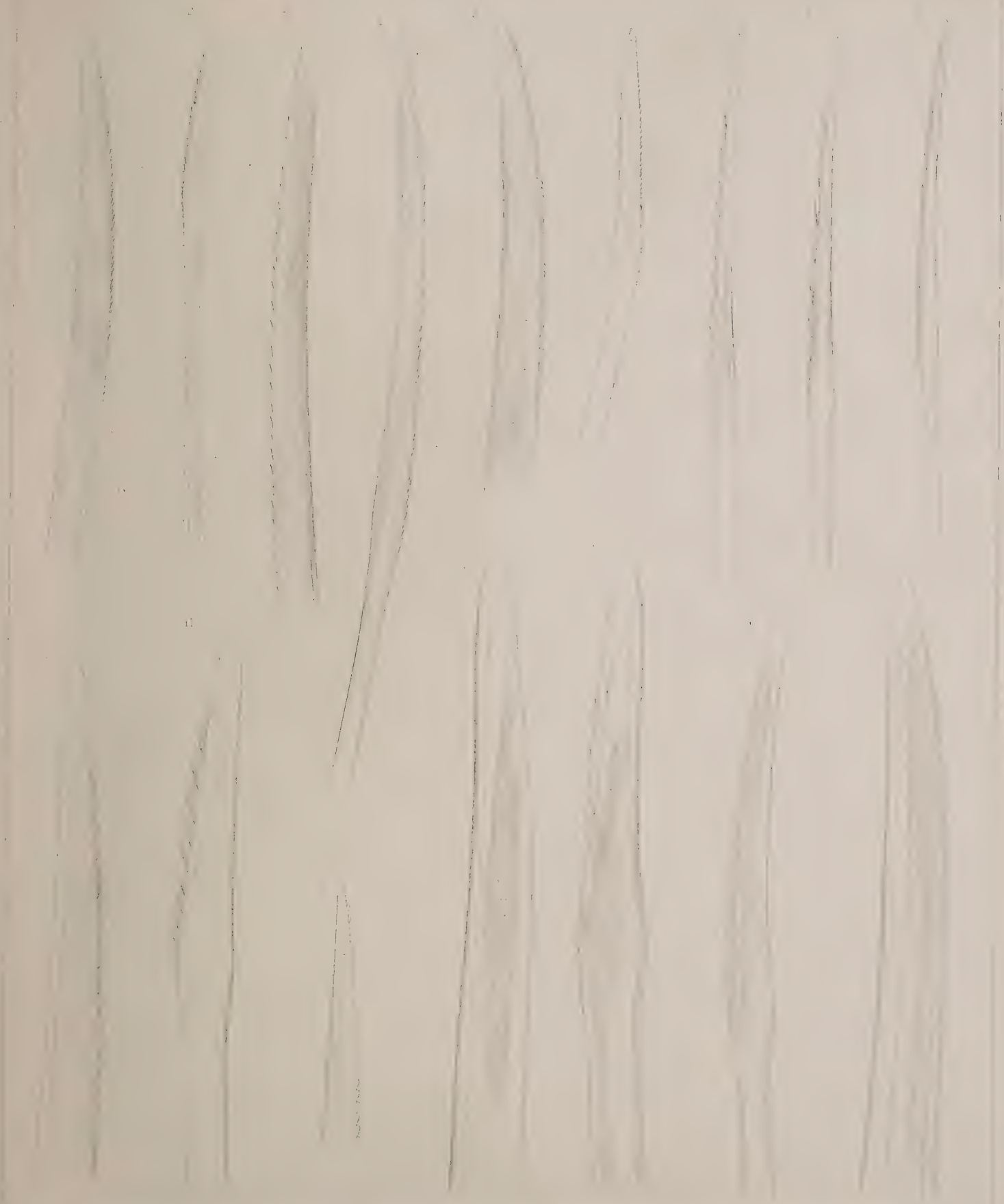
Fig. 12. Tip of a dorsal bristle of *Polyeunoa lævis*, ... × 210.

Fig. 13. Ventral bristle of the foregoing, ... × 210.

Fig. 14. Tip of a dorsal bristle of *Lagisca magellanica*, var. *grubei*, . × 210.

Fig. 15. One of the superior ventral bristles of the same form, . . × 90.

Fig. 16. Tip of a bristle from the middle of the ventral series of the foregoing, ... × 210.



POLYNOIDÆ

PLATE VIIIA.

PLATE VIIIA.

Fig. 1. Tip of one of the stouter dorsal bristles of *Eunoa iphionoides*, . × 210.

Fig. 2. Ventral bristle of the same species, ... × 210.

Fig. 3. Tip of one of the attenuate silky hairs of the dorsal tuft of *Iphione spinosa*, ... × 700.

Fig. 4. Inferior portion of the same bristle, ... × 350.

Fig. 5. Tip of a ventral bristle of the same species in profile, . . × 90.

Fig. 6. A small bristle from the same region of the foot, seen antero-posteriorly, ... × 90.

Fig. 7. One of the fine pale dorsal bristles of *Iphione ovata*, . . × 700.

Fig. 8. Tip of one of the second ventral series in the same species, . × 350.

Fig. 9. Tip of a dorsal bristle of *Eunoa opalina*, ... × 90.

Fig. 10. Abnormal tip (from fracture ?) of one of the same bristles, . . × 90.

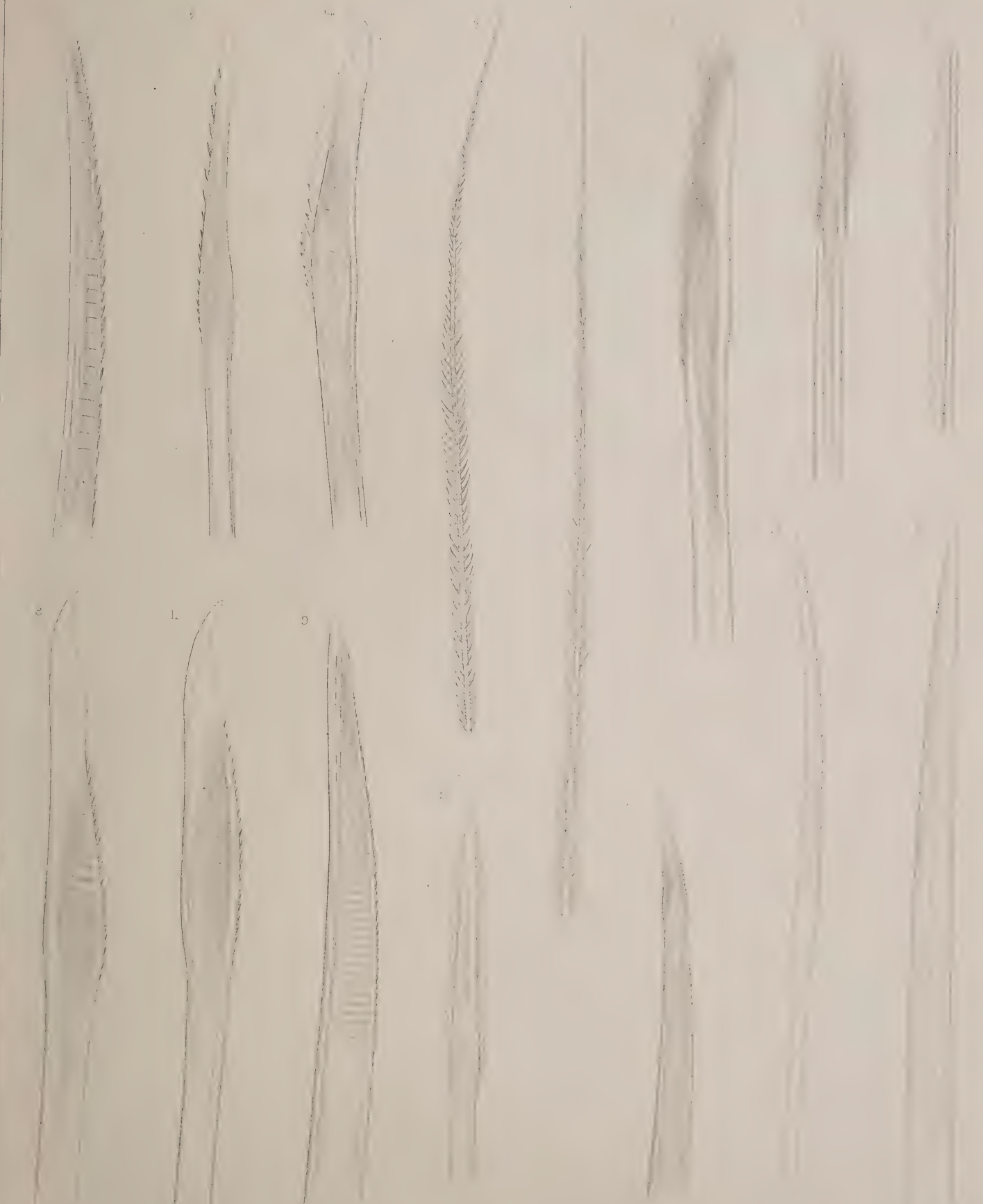
Fig. 11. Pale yellow ventral bristle of the foregoing, . . . × 90.

Fig. 12. Dorsal bristle of *Lænilla fusca*, ... × 90.

Fig. 13. One of the average examples, from the ventral division of the foot, × 90.

Fig. 14. Tip of one of the longer superior ventral bristles of *Polynoë platycirrata*, ... × 210.

Fig. 15. Antero-posterior view of a smaller example from the same region, . × 210.



POLYNOIDÆ

PLATE IXA.

PLATE IXA.

Fig. 1. Dorsal bristles of *Polynoë platycirrata*, ... × 350.

Fig. 2. Dorsal bristle of *Lepidonotus gymnonotus*, ... × 90.

Fig. 3. Tip of average ventral bristle of the same, ... × 210.

Fig. 4. Dorsal bristle of *Polynoë capensis*, ... × 350.

Fig. 5. Ventral bristle of the same, ... × 350.

Fig. 6. Dorsal bristle of *Polynoë pustulata*, ... × 350.

Fig. 7. Tip of a ventral bristle of the same form, ... × 350.

Fig. 8. Attenuate dorsal bristle of *Polynoë* (*Langerhansia*) *euplectellæ*, . × 350.

Fig. 9. Tip of average ventral bristle of the foregoing, . . . × 210.

Fig. 10. Tip of a dorsal bristle of *Evarne tenuisetis*, ... × 350.

Fig. 11. Extremity of one of the superior ventral bristles of the same species, ... × 350.

Fig. 12. Tip of an inferior ventral bristle of the same, . . . × 350.

Fig. 13. Tip of dorsal bristle of *Lagisca magellanica*, var. *murrayi*, . × 90.

Fig. 14. One of the short ventral bristles (from the middle of the series) of the same, ... × 90.

4
14

PLATE Xa.

PLATE XA.

Fig. 1. Extremity of a dorsal bristle of *Polynoë iphionoides*, . . × 90.

Fig. 2. One of the upper or longer ventral bristles of the same, . . × 90

Fig. 3. Dorsal bristle of *Allmaniella setubalensis*, ... × 350.

Fig. 4. One of the ventral bristles of the same, from the middle of the group, × 350.

Fig. 5. Tip of moderately elongated dorsal bristle of *Polynoë magnipalpa*, × 350.

Fig. 6. Ventral bristle of the same, ... × 350.

Fig. 7. Tip of dorsal bristle of *Lagisca* (*Agnodice*) *moseleyi*, . . × 350.

Fig. 8. Tip of ventral bristle of the same, ... × 350.

Fig. 9. Tip of long and boldly curved dorsal bristle of *Harmothoë benthaliana*, ... × 350.

Fig. 10. Tip of one of the intermediate (or average) ventral bristles of the same, ... × 350.

Fig. 11. Tip of a dorsal bristle of *Eunoa yedoensis*, . . . × 350.

Fig. 12. Extremity of a ventral bristle of the same, . . . × 350.

Fig. 13. Dorsal bristle of *Scalisetosus ceramensis*, ... × 350.

Fig. 14. One of the inferior ventral bristles of the same, . . . × 350.

Fig. 15. Dorsal bristle of *Lepidonotus wahlbergi*, ... × 126.

Fig. 16. Ventral bristle of the same, ... × 126.

POLYMORPHA

PLATE XIA.

PLATE XIA.

Fig. 1. One of the shorter and peculiarly curved dorsal bristles of *Eunoa capensis*, ... × 350.

Fig. 2. Tip of another, with a longer smooth extremity, . . . × 350.

Fig. 3. Ventral bristle of the same, ... × 350.

Fig. 4. One of the longer and more slender dorsal bristles of *Lagisca crosetensis*, ... × 90.

Fig. 5. Lateral view of the tip of one of the shorter dorsal bristles of the same, ... × 350.

Fig. 6. Average example from the ventral division of the foot in the foregoing, ... × 210.

Fig. 7. Spine-like bristle from the ventral division of the foot of *Polynoella levisetosa*, ... × 90.

Fig. 8. Dorsal bristle of *Polynoë attenuata*, ... × 350.

Fig. 9. Tip of ventral bristle, from the same, ... × 350.

Fig. 10. Tip of dorsal bristle of *Lepidonotus cristatus*, . . . × 350.

Fig. 11. Tip of a ventral bristle of the foregoing, ... × 210.

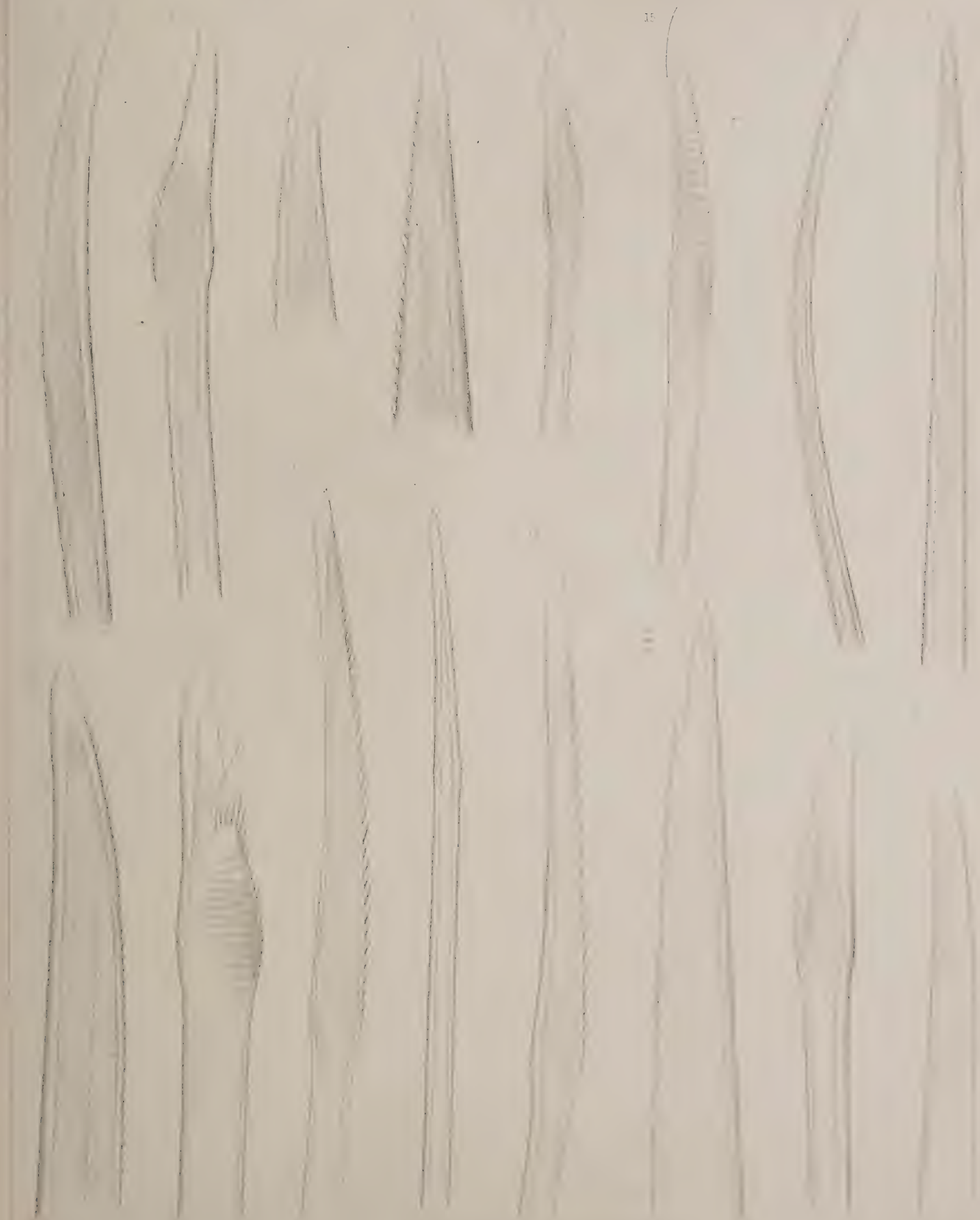
Fig. 12. Dorsal bristle of *Lagisca yokohamiensis* (average example), . × 350.

Fig. 13. Ventral bristle of the same, ... × 210.

Fig. 14. An average form amongst the longer dorsal bristles of *Eunoa abyssorum*, ... × 90.

Fig. 15. Tip of one of the longer (superior) ventral bristles of the preceding, × 90.

Fig. 16. Tip of one of the shorter and smaller inferior bristles, . . × 90.



POLYNOISE

PLATE XIIA.

PLATE XIIa.

Fig. 1. Tip of dorsal bristle of *Lagisca darwini*, ... × 800.

Fig. 2. Extremity of one of the longer ventral bristles of the same, . × 800.

Fig. 3. One of the shorter ventral bristles of the foregoing, . . × 700.

Fig. 4. Extremity of a dorsal bristle of *Lagisca kermadecensis*, . . × 350.

Fig. 5. One of the upper ventral bristles of the same in profile, . . × 350.

Fig. 6. Tip of one of the latter. Viewed antero-posteriorly, . . × 350.

Fig. 7. Dorsal bristle of *Eunoa mindanavensis*, ... × 350.

Fig. 8. Tip of a ventral bristle of the same species, ... × 250.

Fig. 9. Smooth dorsal bristle of *Polynoë* (*Macellicephala*) *mirabilis*, . × 80.

Fig. 10. One of the ventral bristles of the foregoing, . . . × 80.

Fig. 11. Tip of one of the latter, ... × 400.

Fig. 12. Tip of one of the dorsal bristles of *Polynoë synophthalma*, . . × 250.

Fig. 13. Tip of a ventral bristle of the same species, . . . × 250.

Fig. 14. One of the shorter dorsal bristles of *Lagisca hexactinellidæ*, . × 400.

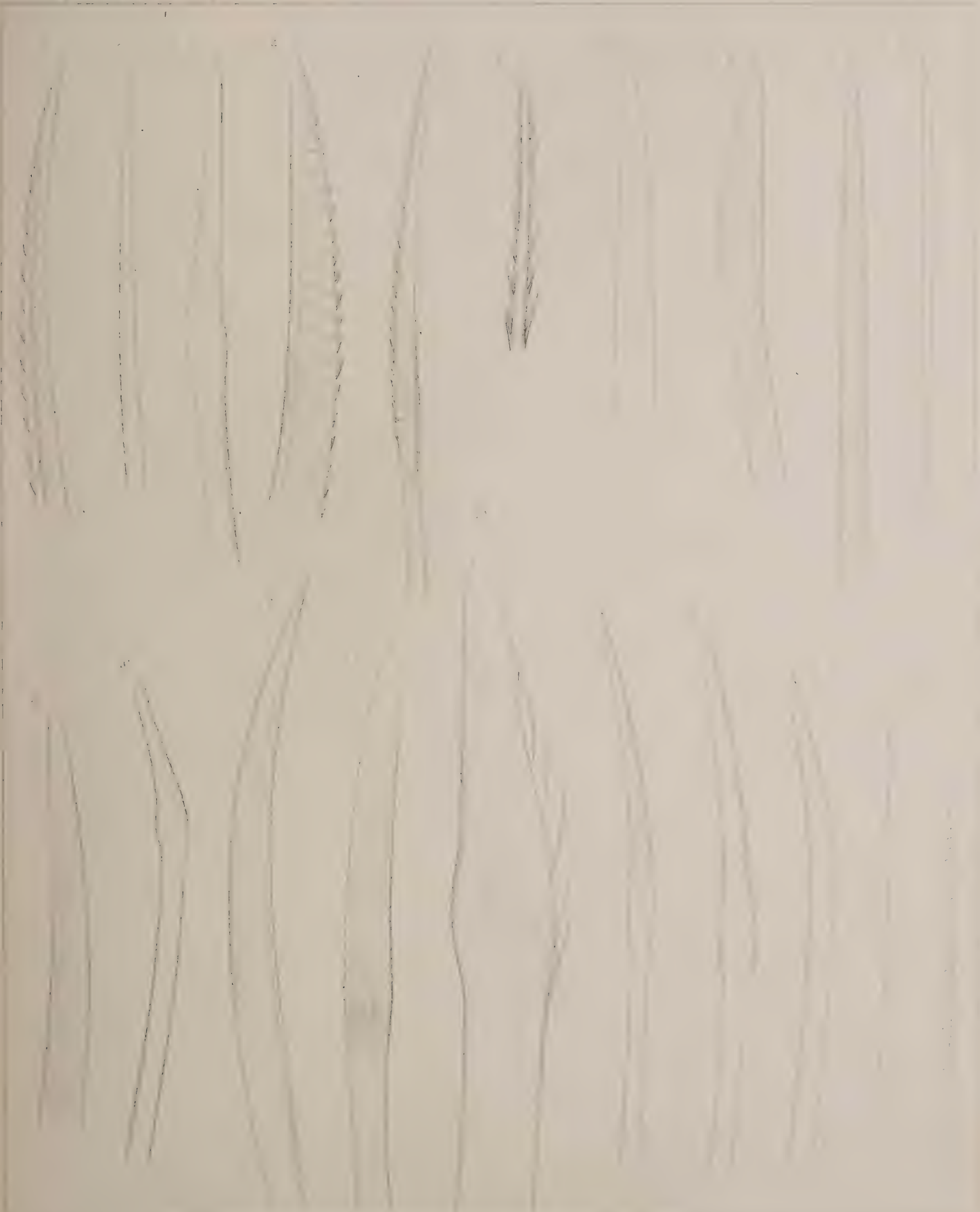
Fig. 15. One of the superior (long) ventral bristles of the same, . . × 400.

Fig. 16. One of the inferior (shorter) ventral bristles, . . . × 400.

Fig. 17. Tip of a ventral bristle of *Polynoë* (*Admetella*) *longipedata*, . × 210.

Fig. 18. Tip of an average ventral bristle, from about the twentieth foot of *Polynoë ocellata*, ... × 800.

Fig. 19. Tip of one of the powerful bristles, from the fiftieth foot of the same. The contrast with the former is bold, . . × 800.



POLYNOINA

PLATE XIIIA.

PLATE XIIIA.

Fig. 1. Ventral bristle (of the anterior third of the body) in *Leanira areolata*, ... × 250.

Fig. 2. Lateral view of a bristle with attenuate spear-tip, from the upper part of the foot of the same, about the anterior third, . . × 104.

Fig. 3. One of the smaller (inferior) bristles of the stout vertical row, showing a minute filiform process at the tip, ... × 80.

Fig. 4. A stout bristle with smooth tip (probably from wear) from the same row, ... × 80.

Fig. 5. One of the larger inferior bristles of the same, in profile, . . × 80.

Fig. 6. Characteristic portion of an average example of the inferior bristles of the foregoing species, ... × 210.

Fig. 7. Dorsal bristle, from the anterior third of *Thalenessa digitata*, . × 210.

Fig. 8. Portion of the thickest region of one of the same, . . . × 350.

Fig. 9. One of the central series of stoutish bristles in the first foot of the foregoing, ... × 210.

Fig. 10. One of the stout ventral bristles in the fully formed foot, showing only a single terminal piece, ... × 210.

Fig. 11. Portion of the thickest region of one of the larger dorsal bristles in the fully formed foot of *Thalenessa oculata*, . . × 350.

Fig. 12. One of the central ventral bristles (in the fully formed foot) of the same, ... × 250.

Fig. 13. Central ventral bristle in the anterior third of *Thalenessa fimbriata*, ... × 400.

Fig. 14. Central or average form of the ventral bristle, from the anterior third of *Psammolyce occidentalis*, ... × 250.

Fig. 15. Tip of one of the more elongated forms, ... × 250.

Fig. 16. Dorsal bristle of *Eupholoë philippensis*, ... × 400.

Fig. 17. One of the central ventral bristles of the same, . . . × 250.

Fig. 18. An average bristle of the ventral divisions of *Psammolyce fijiensis*, ... × 250.

Fig. 19. One of the superior ventral bristles of *Leanira magellanica*, . × 250.

Fig. 20. One of the stouter (median) bristles of the same division of the foot, ... × 250.

SCALIONIDÆ

PLATE XIVA.

PLATE XIVA.

Fig. 1. One of the superior ventral bristles (with whorls of spikes) of *Leanira japanensis*, ... × 250.

Fig. 2. One of the upper and larger ordinary ventral bristles of the same, . × 250.

Fig. 3. Ventral bristle of *Leanira lævis*, ... × 250.

Fig. 4. Serrated bristle, from the inferior division of the tenth foot of *Eulepis wyvillei*, ... × 400.

Fig. 5. One of the powerful golden dorsal hooks, from the middle region of the body in the same species, ... × 100.

Fig. 6. One of the strong winged bristles, from the inferior division of the foot, ... × 110.

Fig. 7. Dorsal hook of *Eulepis challengeriæ*, ... × 400.

Fig. 8. Solitary pectinate bristle, from the superior edge of the inferior division of the foot of the same, ... × 600.

Fig. 9. One of the short, transversely barred bristles of *Nephthys trissophyllus*, ... × 210.

Fig. 10. One of the superior elongated bristles of the same, . . × 90.

Fig. 11. A long posterior bristle from another (smaller) example, having the parasitic Infusorian attached, ... × 90.

Fig. 12. Barred bristle of *Nephthys phyllobranchia*, . . × 400.

Fig. 13. One of the elongated bristles of the same, ... × 90.

Fig. 14. Bristle (average) in profile, from the anterior third of *Phyllodoce* (*Anaitis*) *sanctæ-vincentis*, ... × 800.

Fig. 15. Antero-posterior view of one of the same, ... × 800.

Figs. 16, 17. Two varieties of bristles, from the anterior third of *Eulalia capensis*, ... × 530.

PLATE XVA.

PLATE XVa.

Fig. 1. Bristle of *Phyllodoce duplex*, ... × 800.

Fig. 2. Bristle of *Genetyllis* (?) *oculata*. Viewed somewhat antero-posteriorly, ... × 350.

Fig. 3. Another of the same seen laterally, ... × 350.

Fig. 4. Bristle of *Greeffia oahuensis*, ... × 430.

Fig. 5. Dorsal bristle of *Dalhousia atlantica*, ... × 50.

Fig. 6. One of the longer (superior) ventral bristles of the same, . . × 90.

Fig. 7. One of the forms with shorter tips, ... × 210.

Fig. 8. One of the posterior bristles (with short tip) of a fragmentary *Hesione*, from St. Thomas's, West Indies, ... × 400.

Fig. 9. Another with a longer extremity, ... × 400.

Fig. 10. Average bristle of *Hesione* (*Fallacia*) *pantherina*, . . . × 400.

Fig. 11. Simple solitary bristle of *Salvatoria kerguelensis*, . . . × 400.

Fig. 12. Jointed inferior bristle of the same, ... × 400.

Fig. 13. One of the longer bristles of *Eusyllis kerguelensis*, . . × 400.

Fig. 14. Bristle of *Syllis gigantea*, ... × 250.

Fig. 15. Bristle of *Autolytus maclearanus*, ... × 400.

Fig. 16. Setigerous process of one of the feet, with the bristles of *Syllis setubalensis*, ... × 400.

Fig. 17. Setigerous process of a posterior foot of the foregoing, with the bristles, ... × 400.

Fig. 18. Setigerous lobe of the anterior region of an attached female bud of *Syllis ramosa* (13 on the Plate by mistake), . . . × 400.

Fig. 19. Tip of one of the broad flattened translucent bristles in a free female bud of the same, ... × 400.

Fig. 20. Setigerous region of one of the anterior feet of *Syllis brasiliensis*, . × 400.

Fig. 21. Upper bristle of *Syllis capensis*, ... × 400.

Fig. 22. Bristle of *Sphærosyllis kerguelensis*, ... × 400.

PLATE XVIA.

PLATE XVIA.

Fig. 1. Setigerous region of a foot of *Syllis ramosa* (parent stock), . × 400.

Fig. 2. Dorsal bristle, from the tenth foot of *Nereis* (*Platynereis*) *kobiensis*, ... × 400.

Fig. 3. Amber-coloured hook from the inferior border of the group, from the thirty-seventh foot of the same, ... × 400.

Fig. 4. One of the larger superior falcate bristles, from the inferior division of the foregoing foot, ... × 400.

Fig. 5. One of the dorsal bristles, from the tenth foot of *Nereis tongatabuensis*, ... × 400.

Fig. 6. Falcate bristle, from the superior lobe of the thirty-seventh foot of the foregoing, ... × 590.

Fig. 7. Falcate bristle, from the inferior lobe of the same foot, . . × 590.

Fig. 8. Dorsal bristle, from the thirty-seventh foot of *Nereis melanocephala*, × 400.

Fig. 9. Distal end of a falcate bristle, from the ventral series of the same foot, × 400.

Fig. 10. Setose dorsal bristle, from the thirty-seventh foot of *Nereis atlantica*, × 400.

Fig. 11. A falcate bristle, from the inferior division of the tenth foot of the same, ... × 400.

Fig. 12. Setose dorsal bristle, from the tenth foot of *Nereis longisetis*, . × 400.

Fig. 13. One of the inferior ventral bristles, with very short setose tips, in the twenty-seventh foot of the foregoing, . . . × 400.

Fig. 14. A setose bristle, from the dorsal series of *Nereis antillensis*, . × 400.

Fig. 15. A falcate bristle, from the superior division of one of the posterior feet of the same, ... × 400.

Fig. 16. One of the upper falcate forms, from the ventral division of the foot posteriorly, ... × 400.

Fig. 17. Setose dorsal bristle, from the tenth foot of *Nereis kerguelensis*, . × 400.

Fig. 18. One of the upper falcate bristles, from the inferior series of the tenth foot of the same, ... × 530.

Fig. 19. One of the falcate bristles, from the inferior division of the foot of *Nereis longisetis*, ... × 400.

PLATE XVIIA.

PLATE XVIIa.

Fig. 1. Setose bristle, from the middle of the superior series of the tenth foot of *Nereis patagonica*, ... × 400.

Fig. 2. A falcate bristle, from the inferior series of the same foot, . . × 530.

Fig. 3. A setose bristle, from the middle of the superior series of the twelfth foot (in water) of *Nereis brasiliensis*, ... × 400.

Fig. 4. A falcate bristle, from the inferior border of the twelfth foot of the same, ... × 530.

Fig. 5. Peculiar crenate dorsal bristle of *Staurocephalus atlanticus*, . × 800.

Figs. 6, 7. Superior and inferior bristles of the ventral division of the foot of the foregoing, ... × 450.

Fig. 8. One of the slender elongate bristles from the ventral division of the foot in the same, ... × 350.

Fig. 9. One of the shorter dorsal bristles of *Staurocephalus australiensis*, . × 250.

Fig. 10. Ventral bristle of the foregoing, ... × 250.

Fig. 11. One of the superior winged bristles (in calcium chloride), from the tenth foot of *Lumbriconereis pettigrewi*, . . . × 250.

Fig. 12. Bristle, from the middle of the same foot, ... × 250.

Fig. 13. A posterior hook (in profile) of the same form, viewed laterally, . × 400.

Fig. 14. An antero-posterior view of a smaller hook from the same region, . × 400.

Fig. 15. Elongated hook, from the tenth foot of a variety of *Lumbriconereis pettigrewi*, ... × 250.

Fig. 16. Profile view of the upper hook, from a foot near the middle of the body of *Lumbriconereis bifurcata*, . . . × 400.

Fig. 17. One of the third series (jointed hooks), from the anterior third of *Lumbriconereis japonica*, ... × 250.

Fig. 18. A posterior hook of *Lumbriconereis kerguelensis*, . . . × 400.

PLATE XVIIIA.

PLATE XVIIIA.

Fig. 1. A lateral view of one of the posterior hooks of *Lumbriconereis japonica*, ... × 250.

Fig. 2. One of the winged bristles next the winged hooks in the tenth foot of *Lumbriconereis kerguelensis*, ... × 250.

Fig. 3. The upper hook of the series in the tenth foot of the same, . × 400.

Fig. 4. Two of the extremely elongated bristles projecting from the thirtieth foot of the foregoing, ... × 90.

Fig. 5. One of the elongated bristles, from the sixteenth foot of *Lumbriconereis neo-zealaniæ*, var. A, ... × 250.

Fig. 6. Posterior hook of the same, var. A, ... × 400.

Fig. 7. Posterior (and superior) hook of *Lumbriconereis neo-zealaniæ*, var. B, × 400.

Fig. 8. Winged bristle, from the sixteenth segment of the same (var. B), . × 250.

Fig. 9. The third winged hook (viewed antero-posteriorly) of the tenth foot of the foregoing (var. B), ... × 250.

Fig. 10. Posterior hook of *Lumbriconereis abyssorum*, . . . × 400.

Fig. 11. Posterior hook of *Lumbriconereis punctata*, . . . × 400.

Fig. 12. Posterior hook of *Lumbriconereis ehlersi*, var. *tenuisetis*, . . × 400.

Fig. 13. An average hook, from the fragmentary example of *Lumbriconereis heteropoda*, ... × 250.

Fig. 14. Tip of a bristle (from the group below the dorsal hook) of the foregoing, ... × 250.

Fig. 15. A posterior bristle of *Notocirrus capensis*, ... × 250.

Fig. 16. Dorsal bristle, from the thirtieth foot of *Nematonereis schmardæ*, . × 400.

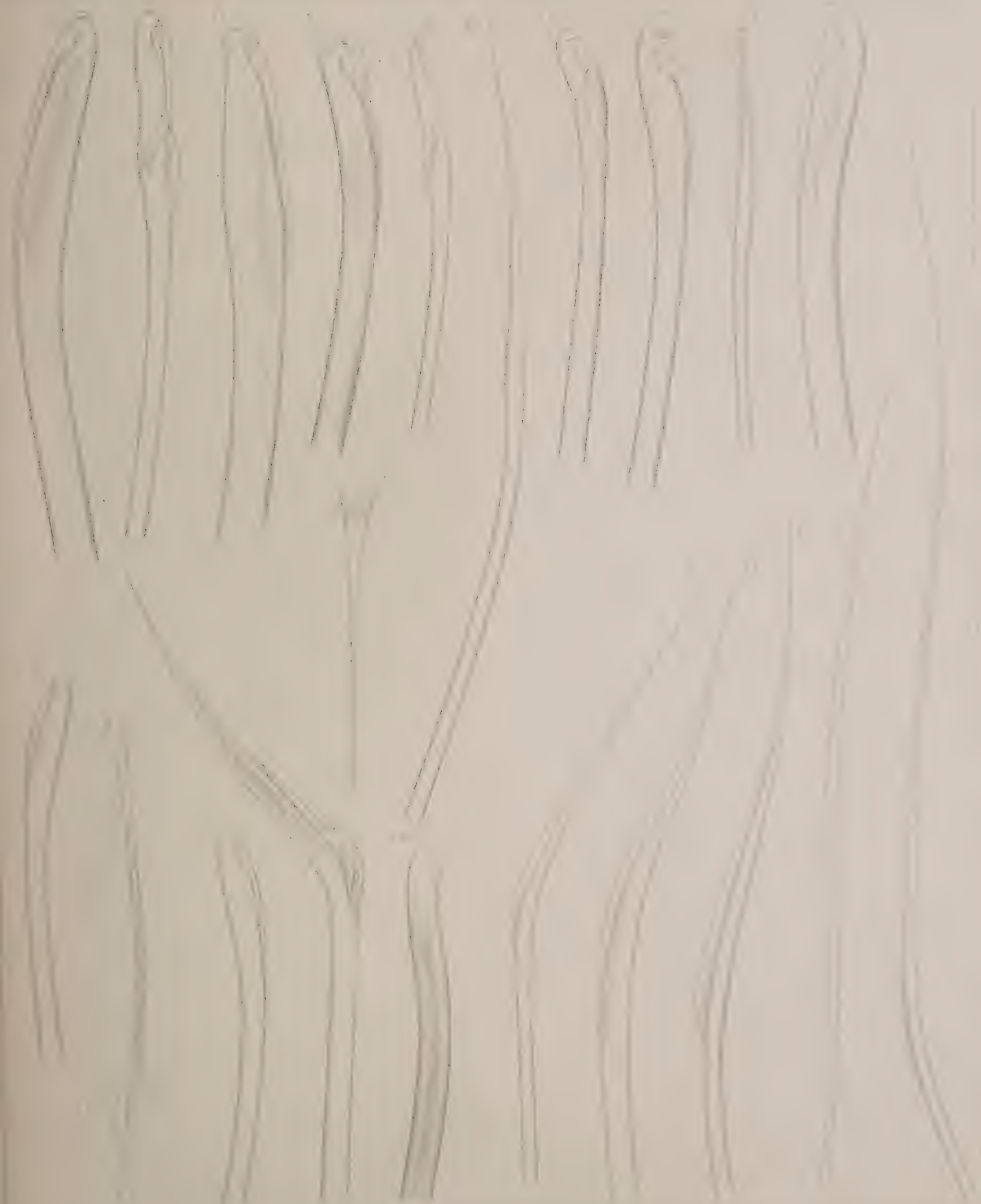
Fig. 17. Jointed bristle, from the thirtieth foot of the same, . . × 400.

Fig. 18. Upper brownish spine (with hook and wing), from the fiftieth foot of the foregoing, ... × 400.

Fig. 19. Brush-like bristle, from the posterior region of the same, . . × 400.

Fig. 20. One of the stouter bristles, from a fragment of a male specimen of *Palolo viridis*, ... × 400.

Fig. 21. A jointed bristle from the same specimen, ... × 400.



LUMBRINEREIS

PLATE XIXA.

PLATE XIXA.

Fig. 1. Brush-shaped bristle of *Nematonereis* (fragment) from Sea Point. From the superior division of the foot, . . . × 350.

Fig. 2. Articulated ventral bristle of the same species, . . . × 350.

Fig. 3. Brush-shaped bristle, from the superior branch of *Nematonereis*, from St. Vincent, ... × 350.

Fig. 4. Compound bristle, from the inferior division of the foot of the same species, ... × 350.

Fig. 5. Long hook, from the inferior division of the foregoing, just after development (*i.e.*, unworn), ... × 350.

Fig. 6. Dorsal bristle of *Eunice magellanica*, ... × 210.

Fig. 7. Brush-shaped bristle from the same group, ... × 350.

Fig. 8. Compound bristle, from the inferior division of the foot of the foregoing, ... × 210.

Fig. 9. Strong bifid posterior hook from the same, one of the wings only being indicated, ... × 210.

Fig. 10. Compound bristle, from the inferior division of the foot of *Eunice prognatha*, ... × 350.

Fig. 11. Tip of stout blackish hook, from the posterior region of the same, . × 210.

Fig. 12. Compound bristle, from the inferior group of the twentieth foot of *Eunice torresiensis*, ... × 350.

Fig. 13. Posterior hook, from the same species, ... × 210.

Fig. 14. Compound bristle, from the twentieth foot of *Eunice œrstedi*, off Marion Island, ... × 350.

Fig. 15. Compound bristle, from the same foot of a specimen of *Eunice norvegica* from Bergen, Norway, ... × 350.

Fig. 16. Compound bristle, from the twentieth foot of *Eunice vittata*, . × 350.

Fig. 17. Posterior hook, from the same species, ... × 350.

Fig. 18. Compound bristle, from the inferior border of the twentieth foot of *Marphysa goodsiri*, ... × 350.

Fig. 19. Tip of the posterior hook of the same species, . . . × 350.

Fig. 20. One of the lower (broader) bristles, from the dorsal group of the foregoing, ... × 350.

Fig. 21. Superior bristle, from the twentieth foot of *Eunice cirrobranchiata*. Not altogether a lateral view, ... × 210.

Fig. 22. Compound bristle from the same foot, slightly turned round, . × 350.

Fig. 23. A more completely lateral view of a bristle from the same foot, the shaft being somewhat injured by compression, . . × 350.

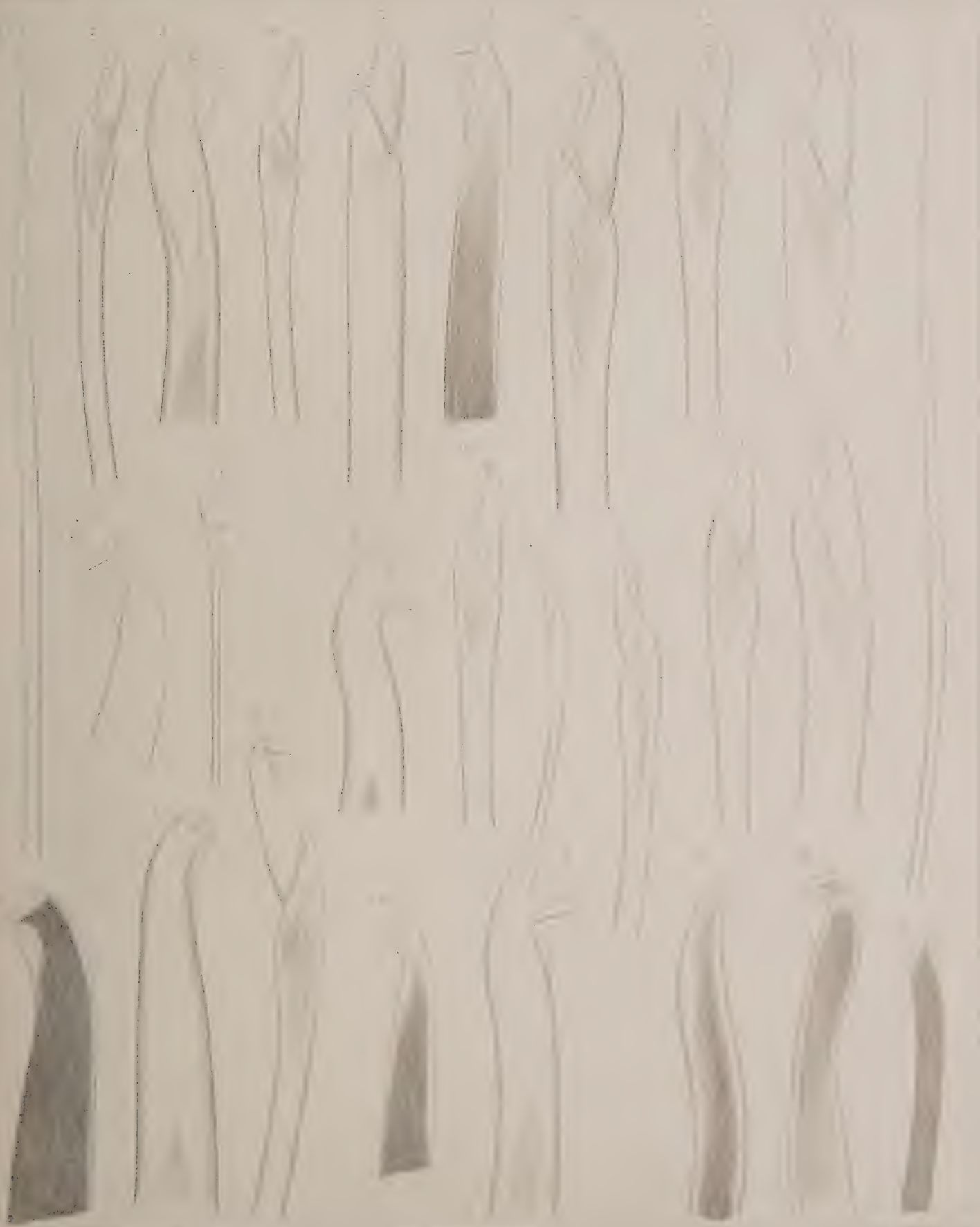
Fig. 24. Posterior hook of the same species, with the usual double wing, . × 210.

LUMBRINERIDÆ & LUMBRICIDÆ

PLATE XXA.

PLATE XXA.

Fig. 1. Dorsal bristle, from the anterior region of *Eunice kobiensis*, . × 350.
Fig. 2. Compound bristle, from the fortieth foot of the same, mounted in calcium chloride, ... × 350.
Fig. 3. Posterior hook of the foregoing, ... × 350.
Fig. 4. Dorsal bristle, from the tenth foot of *Eunice edwardsi*. Viewed nearly but not quite laterally, ... × 350.
Fig. 5. Brush-shaped bristle, from the same foot, ... × 350.
Fig. 6. Compound bristle of the same species, from the middle of the body, × 350.
Fig. 7. Inferior hook of the foregoing, ... × 350.
Fig. 8. Compound bristle, from the middle region of *Eunice aphroditois*, . × 210.
Fig. 9. Posterior hook, from the same form, ... × 210.
Fig. 10. Compound bristle, from the anterior third of *Eunice aphroditois* from Samboangan, ... × 126.
Fig. 11. Tip of a compound bristle, from the twentieth foot of *Eunice torquata*, ... × 350.
Fig. 12. Fully developed and somewhat worn hook, from the posterior region of the same, ... × 210.
Fig. 13. Developing hook of the foregoing not yet projecting beyond the foot. The wing is imperfectly seen from the opacity of the surrounding tissue, ... × 210.
Fig. 14. Compound bristle, from one of the smaller examples of *Eunice elseyi*, × 350.
Fig. 15. Similar bristle, from a large example of the foregoing species, . × 350.
Fig. 16. Posterior hook from the latter specimen. The wing or guard, which is seldom complete, has been restored after an examination of several, ... × 210.
Fig. 17. Compound bristle, from the twentieth foot of *Nicidon balfouriana*, × 350.
Fig. 18. Posterior hook, from the foregoing, ... × 350.
Fig. 19. Compound bristle, from the twentieth foot of *Eunice murrayi*, . × 350.
Fig. 20. Recently developed hook, from the posterior region of the same, . × 350.
Fig. 21. Compound bristle (in water), from the twentieth foot of *Eunice mindanavensis*, ... × 350.
Fig. 22. Inferior hook of the same, ... × 210.
Fig. 23. Compound bristle, the shaft being slightly turned round, from the twentieth foot of *Eunice equibranchiata*, . . . × 350.
Fig. 24. Inferior hook of the same, ... × 210.
Fig. 25. Bifid hook of *Macduffia bonhardi*, ... × 350.
Fig. 26. Compound bristle of the foregoing, ... × 350.



EUNICIDÆ

PLATE XXIA.

PLATE XXIa.

Fig. 1. Brush-shaped bristle, from the dorsal series of the twentieth foot of *Eunice barvicensis*, ... × 350.

Fig. 2. Compound bristle, from the same foot, ... × 350.

Fig. 3. Posterior hook of the foregoing, ... × 350.

Fig. 4. Compound bristle (nearly developed and unworn), from the ventral border of the twentieth foot of *Eunice pycnobranchiata*, . × 350.

Fig. 5. Inferior hook, from the same, ... × 350.

Fig. 6. Compound bristle of *Eunice tribranchiata*, . . × 350.

Fig. 7. Inferior hook of the same, ... × 210.

Fig. 8. Compound bristle, from the superior group in *Eunice bassensis*, . × 210.

Fig. 9. Inferior hook, from the same species, . . . × 210.

Fig. 10. Compound bristle, from *Eunice* (fragment) from Bermuda, . × 350.

Fig. 11. Posterior hook of the same species, ... × 350.

Fig. 12. Brush-shaped bristle, from the dorsal series of the foregoing *Eunice*, × 350.

Fig. 13. Compound bristle, from the same species, ... × 350.

Fig. 14. Inferior spine (corresponding to the hook) of the same, . . × 90.

Fig. 15. Hook, from one of the posterior feet of *Hyalinœcia benthaliana*, . × 350.

Fig. 16. Bifid bristle, from the first foot of a dried example of the same, . × 350.

Fig. 17. Bifid bristle, from the first foot of *Nothria minuta*, . . × 350.

Fig. 18. Hooks, from the twentieth foot of the same, . . . × 350.

Fig. 19. Worn bifid bristle, from the first foot of a large example of *Nothria sombreriana*. The wings have been broken off, . . × 350.

Fig. 20. More perfect bristle, from the same foot of a young specimen, . × 350.

Fig. 21. Tip of an anterior dorsal bristle (simple) from the same, . . × 350.

Fig. 22. Brush-shaped bristle from the foregoing, ... × 350.

Fig. 23. Hook, from the twentieth foot of the same, . . . × 350.

Fig. 24. Bifid bristle, from the first foot of *Nothria tenuisetis*, . . × 350.

Fig. 25. Hook (superior), from the twentieth foot of the same, . . × 350.

Fig. 26. Hook (superior), from the posterior region of the foregoing, one wing being bent downward, ... × 350.

Fig. 27. Bifid bristle [1] (probably slightly worn), from the first foot of *Nothria abranchiata*, ... × 90.

[1] It is well to bear in mind that Farrant's solution obliterates many of the markings toward the tip.

EUNICIDÆ & ONUPHICIDÆ

PLATE XXIIA.

PLATE XXIIA.

Fig. 1. Dorsal bristle, from the twentieth foot of *Nothria abranchiata*, . × 210.
Fig. 2. Inferior bristle, from the same foot, ... × 210.
Fig. 3. Hook, from the twentieth foot of the foregoing, . . . × 210.
Fig. 4. Bifid bristle, from the first foot of *Nothria pycnobranchiata*, . × 210.
Fig. 5. Lower hook, from the twentieth foot of the same, . . . × 210.
Fig. 6. Bifid bristle, from the first foot of *Nothria macrobranchiata*, . × 210.
Fig. 7. Hook, from the middle of the foot (about twentieth) of the same, ... × 210.
Fig. 8. Bristle, from the twentieth foot of *Eone trifida*, in calcium chloride, ... × 350.
Fig. 9. Blunt spine, from the fiftieth foot of the same, . . . × 350.
Fig. 10. Bristle, from the upper edge of the inferior series of the twentieth foot in *Glycera sagittariæ*, ... × 350.
Fig. 11. Bristle, from the middle of the ventral series in *Glycera lamelliformis*, ... × 350.
Fig. 12. One of the lower series of the superior tuft of the thirtieth foot in *Hemipodus magellanicus*, ... × 350.
Fig. 13. One of the lower series of the superior division of the ventral bristles of the thirtieth foot of the same, ... × 350.
Fig. 14. Bristle, from the middle of the inferior series of the ventral bristles of the thirtieth foot in the foregoing species, . . . × 350.
Fig. 15. The middle bristle (of the three), from the inferior ventral series of the ninetieth foot in the same, ... × 350.
Fig. 16. Stout bristle, from the anterior region of *Aricia platycephala*, . × 210.
Fig. 17. Basal region of a serrated bristle, from the same region of the foregoing, the tip being fractured, ... × 210.
Fig. 18. Long and peculiarly curved bristle, from the tenth foot of *Aricidia fragilis*, ... × 350.
Fig. 19. Long bristle, from the ventral tuft of the eighth foot of *Scoloplos kerguelensis*, ... × 350.
Fig. 20. Forked bristle, from the tenth foot of *Eumenia reticulata*, . . × 350.
Fig. 21. Forked bristle, from about the fortieth foot of *Scalibregma inflatum*, var., ... × 350.
Figs. 22, 23. Two bristles, from *Ephesia antarctica*, the former being slightly turned, ... × 350.

ONUPHIDIDÆ GLYCERIDÆ ARICIIDÆ

PLATE XXIIIA.

PLATE XXIIIA.

Fig. 1. Portion of a bristle, from the inferior tuft of the second foot of *Trophonia capensis*, ... × 116.

Fig. 2. Hook, from the ventral tuft of the tenth foot of the same, . . × 90.

Fig. 3. Posterior bristle with hooked tip, from the foregoing, . . . × 55.

Fig. 4. Portion (near the tip) of a superior bristle, from the tenth foot of *Trophonia kerguelarum*, ... × 350.

Fig. 5. Hook, from the lower border of the tenth group of the same, . × 90.

Fig. 6. Upper hook, from the same series, ... × 90.

Fig. 7. Portion of one of the larger frontal bristles of *Brada mammillata*, with parasitic Infusoria, ... × 90.

Fig. 8. Ventral hook, from the tenth foot of the same, . . . × 90.

Fig. 9. Basal region of one of the anterior bristles of *Brada whiteavesii*, . × 350.

Fig. 10. Anterior hook of the foregoing, ... × 90.

Fig. 11. Portion of the basal region of a dorsal bristle, from the first foot of *Trophonia wyvillei*. The proximal end is inferior, . × 90.

Fig. 12. Portion of the slender distal region of the same bristle where the striæ are evident, ... × 90.

Fig. 13. Bristle, from the ventral series of the tenth foot of the foregoing, . × about 40.

Fig. 14. Tip of one of the same series, ... × 90.

Fig. 15. Extremity of a bristle, from the first series of *Buskiella abyssorum*, . × 350.

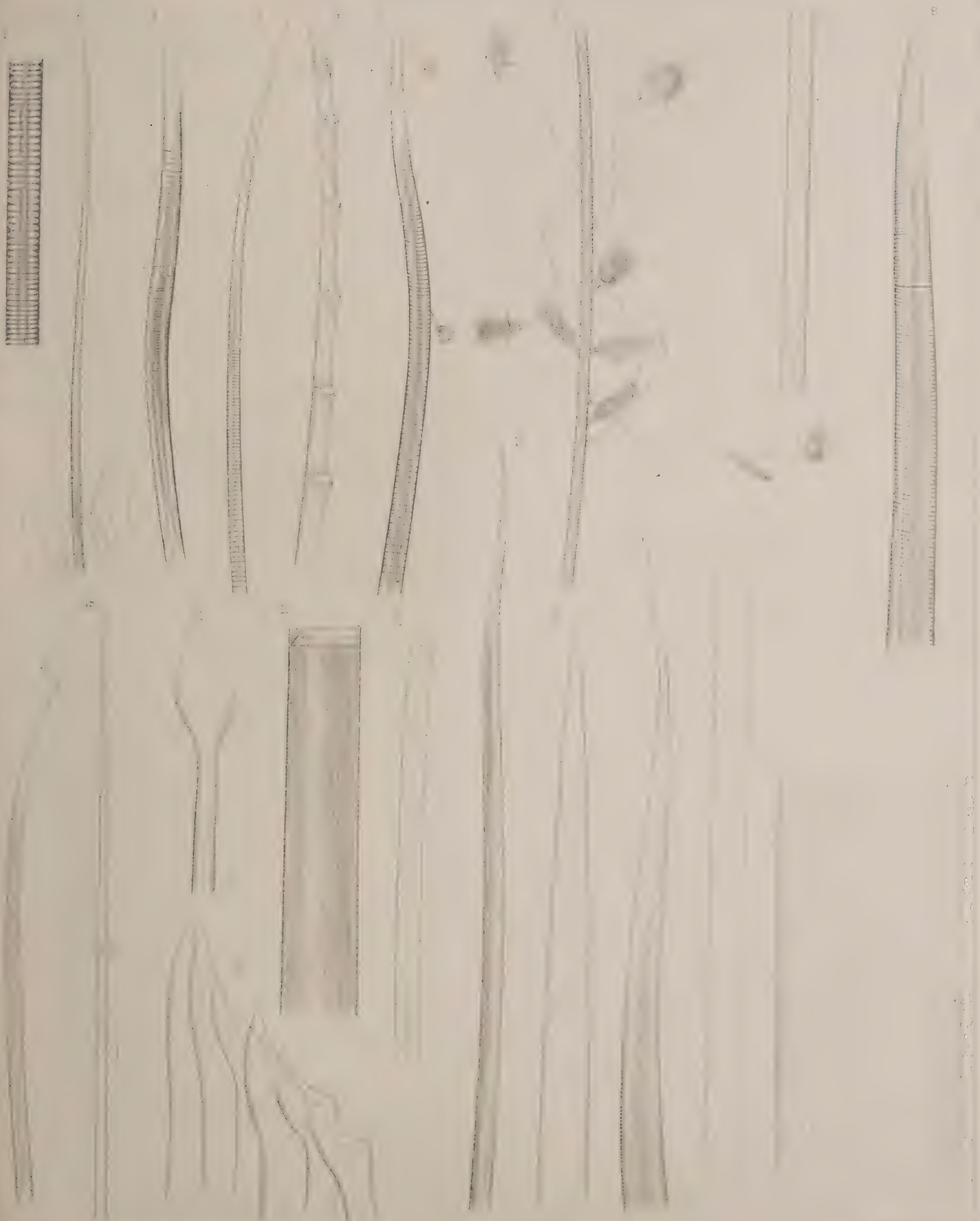
Fig. 16. Portion from the middle of one of the smaller forms from the same group, ... × 350.

Fig. 17. The same region of the bristle so as to show the length of the divisions on each side of the transverse bar, . . . × 55.

Fig. 18. Tip of one of the ventral bristles from the foregoing, . . × 350.

Fig. 19. Group of the fourth series of bristles in *Ranzania capensis*, . × 350.

Fig. 20. Bristle with expanded tip, from the same foot, . . . × 350.



CHLORÆMIDÆ &c

PLATE XXIVA.

PLATE XXIVA.

Fig. 1. One of the first series of bristles in *Phyllochætopterus claparedii*, in profile, ... × 350.

Fig. 2. The same seen antero-posteriorly, ... × 350.

Fig. 3. Strong brownish spine, from the middle of the third series of bristles in the foregoing form, ... × 90.

Fig. 4. Bristle, from the fifth series in this species, ... × 350.

Fig. 5. Group of bristles, from the posterior region in the same example, . × 350.

Fig. 6. Hook, from about the fiftieth foot of *Scolecolepis cirrata*, var. 2, from Sombrero and St. Thomas, ... × 350.

Fig. 7. One of the larger hooks, from the tenth foot of *Prionospio capensis*, seen partly but not quite in profile, ... × 350.

Fig. 8. A smaller example from the same foot, exhibiting a full profile, . × 350.

Fig. 9. Fragment of a dorsal bristle, from the tenth series of *Cirratulus capensis*, ... × 350.

Fig. 10. Hook, from the posterior region of the same (in Farrant's solution), × 55.

Fig. 11. Hook, from the posterior part of the fragment of *Cirratulus assimilis*, × 350.

Fig. 12. Dorsal bristle, from the tenth foot of *Chætozone atlantica*, . . × 55.

Fig. 13. Dorsal bristle, from the tenth foot of *Chætozone benthaliana*, . × 55.

Fig. 14. Posterior ventral bristles and spines in the same form, . . × 350.

Fig. 15. Anterior hook of *Notomastus agassizii*, ... × 500.

Fig. 16. Hook, from the second region of *Eunotomastus grubei*, . . × 500.

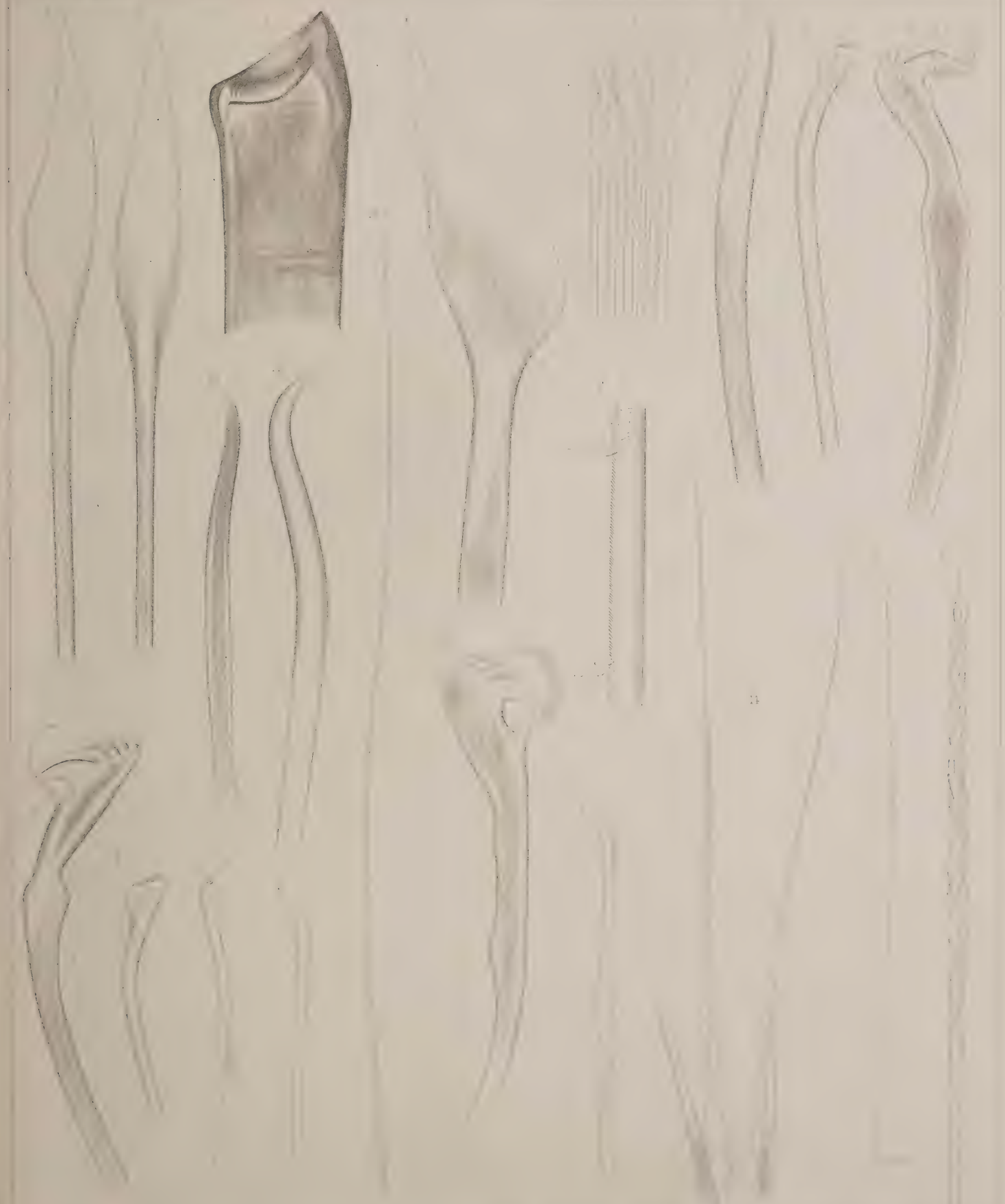
Fig. 17. Hook of *Dasybranchus* sp. (fragment), ... × 500.

Fig. 18. Dorsal bristle, from the eighth foot of *Nicomache capensis*, . × 350.

Fig. 19. Ventral hook, from the same foot of the foregoing, . . . × 350.

Fig. 20. Hook, from the eighth bristled foot of *Nicomache japonica*. . × 350.

Fig. 21. Posterior hook of *Nicomache* (?) *benthaliana*, . . . × 350.

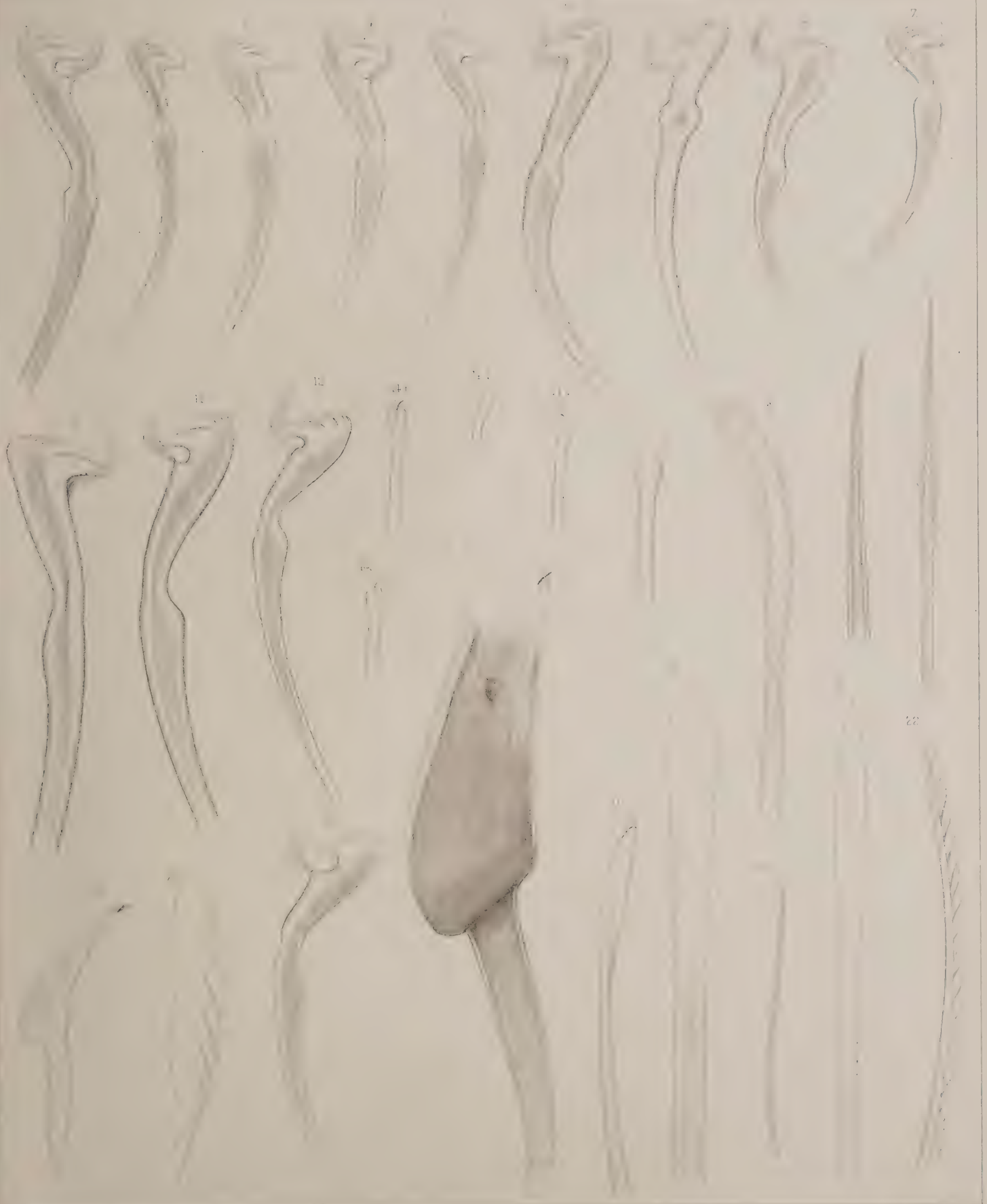


CHÆTOPTERIDÆ. SPIONIDÆ. CIRRATULIDÆ. MALDANIDÆ &c

PLATE XXVA.

PLATE XXVA.

Fig. 1. Hook, from the fourteenth row of *Maldane malmgreni*, . . × 210.
Fig. 2. Hook, from the sixth segment of *Praxilla köllikeri*, . . × 350.
Fig. 3. Hook, from the eighth segment of *Praxilla lankesteri*, . . × 350.
Fig. 4. Hook, from the eighth segment of *Maldane* (?) *atlantica*, . × 350.
Fig. 5. Posterior hook of *Praxilla* (?) *challengeriæ*, . . × 430.
Fig. 6. Hook, from the eighth segment of *Praxilla kerguelensis*, . . × 350.
Fig. 7. Hook, from the eighth segment of *Praxilla assimilis*, . . × 350.
Fig. 8. Hook, from the eighth segment of *Praxilla capensis*, . . × 350.
Fig. 9. Hook, from a fragmentary specimen of *Maldane* (?), . . × 350.
Fig. 10. Hook, from a fragment of *Praxilla occidentalis*, . . . × 350.
Fig. 11. Hook, from the eighth segment of *Maldanella antarctica*, . × 234.
Fig. 12. Hook, from the eighth segment of *Maldanella valparaisiensis*, . × 430.
Fig. 13. Hook, from the eighth segment of *Maldanella neo-zealaniæ*, . × 350.
Fig. 14. *a*, *b*, *c*, *d*. Various views of the hooks of *Myriochele heeri*, and var. from Station 47, ... × 1200.
Fig. 15. Hook of *Myriochele pacifica*, ... × 1200.
Fig. 16. One of the outer paleæ of the cephalic region of *Sabellaria* (*Pallasia*) *johnstoni*, ... × 55.
Fig. 17. Tip of one of the inner paleæ from the same specimen, . . × 55.
Fig. 18. Bristle from the first tuft in the foregoing, . . . × 90.
Fig. 19. Dorsal bristle, from the anterior region of the same, . . × 90.
Fig. 20. Intermediate (and more minute) oar-shaped bristle, from the same tuft, ... × 350.
Fig. 21. Ventral bristle, from the same foot, ... × 210.
Fig. 22. *a*. Portion of a delicate spinous bristle, from the ventral tuft of the posterior region of the foregoing species. *b*. A similar fragment of a more minute example, . . . × 350.
Fig. 23. Anterior hook of the preceding, ... × 700.
Fig. 24. One of the outer paleæ of the cephalic region of *Sabellaria* (*Pallasia*) *capensis*, ... × 55.
Fig. 25. Another of the same, viewed laterally, ... × about 35.

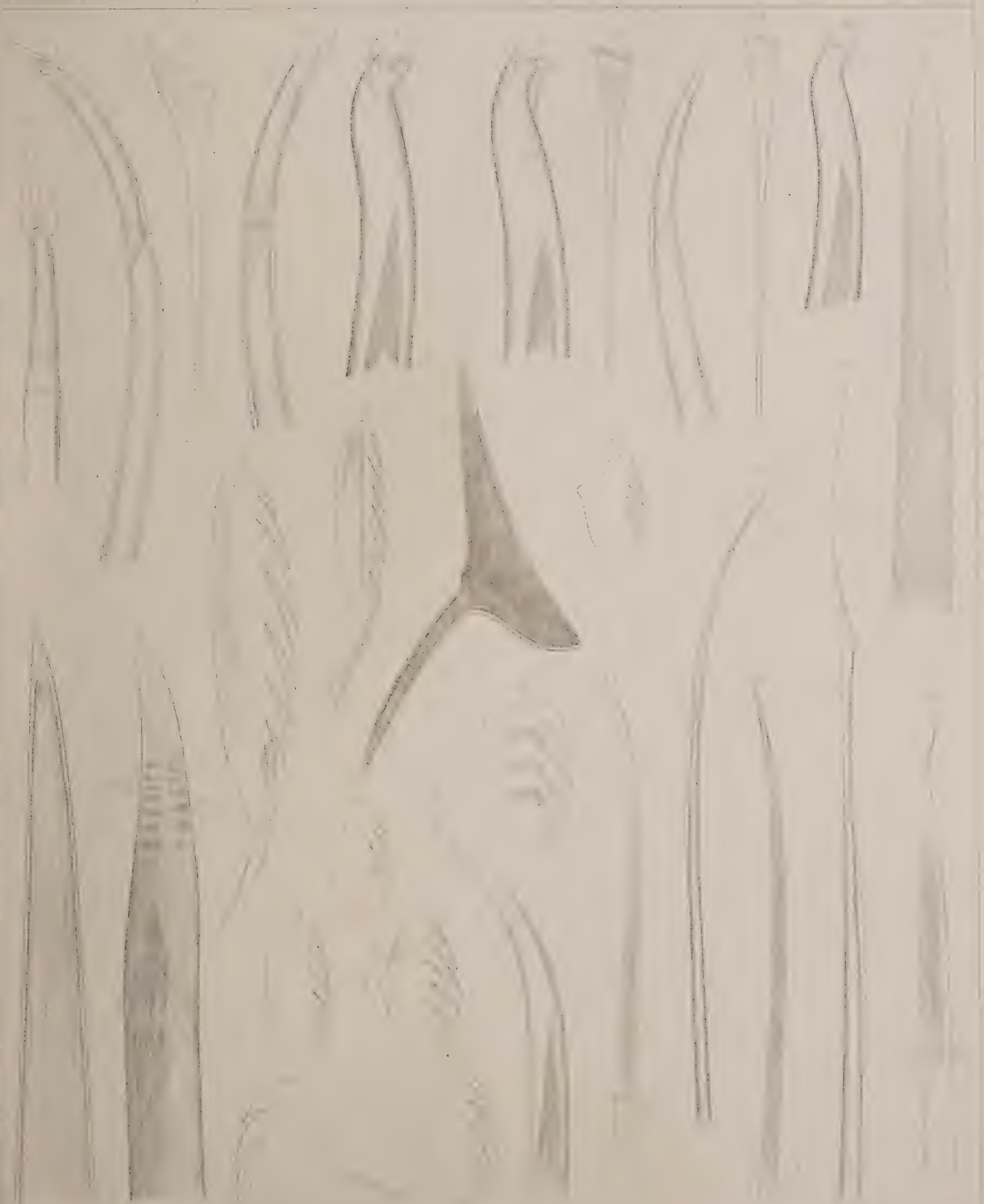


MALDANIDÆ, AMMOCHARIDÆ & HEPHELLIDÆ.

PLATE XXVIA.

PLATE XXVIa.

Fig. 1. Bifid bristle, from the third foot of *Nothria willemoesii*, . . . × 350.
Fig. 2. Bristle from the same foot, viewed antero-posteriorly, so as to exhibit the "wing," . . . . . × 430.
Fig. 3. Delicate brush-shaped bristle, from the posterior region of the foregoing, ... × 350.
Fig. 4. Bifid hook, from the posterior region of the same, . . . × 210.
Fig. 5. Bifid bristle, from the first region of *Nothria ehlersi*, . . × 350.
Fig. 6. Hook, from the posterior region of the same, ... × 210.
Fig. 7. Brush-shaped bristle, from the twentieth foot of the foregoing, . × 350.
Fig. 8. Bifid bristle, from the first foot of *Nothria armandi*, . . × 350.
Fig. 9. Brush-shaped bristle, from the twentieth foot of the same, . . × 350.
Fig. 10. Hook, from the fiftieth foot of the foregoing, . . . × 210.
Fig. 11. One of the inner paleæ of *Sabellaria* (*Pallasia*) *capensis*, . × about 40.
Fig. 12. Hook of the same species (slightly turned), . . . × 700.
Fig. 13. Outer palea of the crown of *Sabellaria* (*Pallasia*) *australiensis*, . × 90.
Fig. 14. Tip of one of the inner paleæ of the same, ... × 90.
Fig. 15. Hook of the foregoing, ... × 700.
Fig. 16. Winged bristle, from the anterior region of *Petta assimilis*. The figure shows part of both wings, ... × 210.
Fig. 17. Winged bristle of the same, with a delicate limb at the tip, . × 210.
Fig. 18. Strong hook-like caudal bristle from the foregoing, . . × 210.
Fig. 19. Hook of the same form, ... × 700.
Fig. 20. Paleola (of average size) of *Ampharete sombreriana*, . . × 90.
Fig. 21. Uncinus of the same, ... × 700.
Fig. 22. Paleola from the middle of the group in *Ampharete kerguelensis*, . × 114.
Fig. 23. Tip of a paleola from a smaller specimen of the same species, showing the filiform tip and the wing-like process at the margin, × 700.
Fig. 24. Hook of the same, ... × 700.
Fig. 25. Hook of *Phyllocomus croceus*, ... × 350.
Fig. 26. Bristle from the anterior region of *Amphicteis gunneri*, var. *atlantica*, ... × 55.
Fig. 27. Hook of the same, ... × 700.
Fig. 28. Hook of *Amphicteis gunneri*, from the Gulf of St. Lawrence, Canada, ... × 700.
Fig. 29. Hook of *Amphicteis gunneri*, from Shetland, . . . × 700.

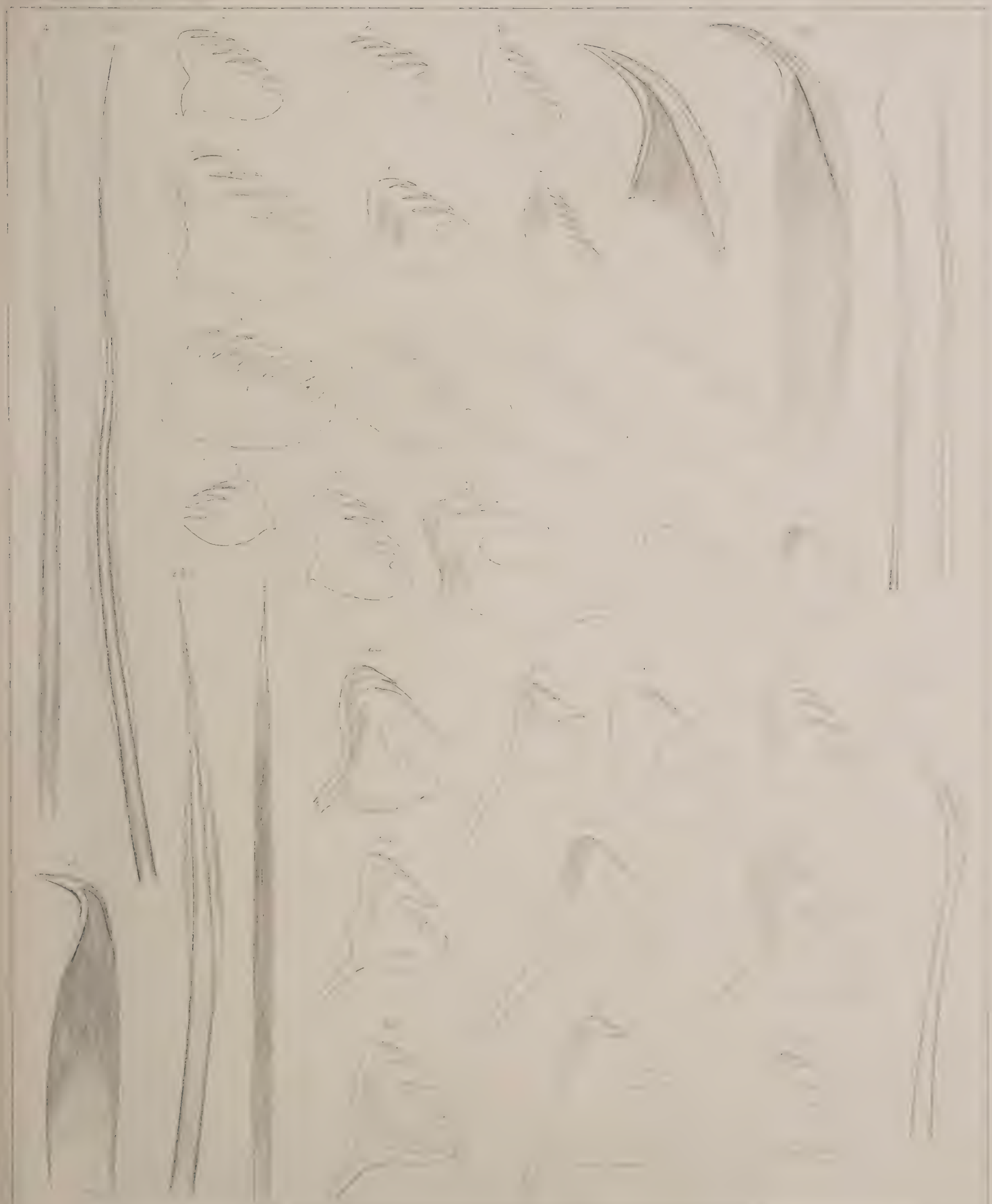


ENIDÆ & AMPHARETIDÆ

PLATE XXVIIa.

PLATE XXVIIa.

Fig. 1. Hook of *Amphicteis sarsi*, ... × 700.
Fig. 2. Hook of *Amphicteis wyvillei*, ... × 700.
Fig. 3. Paleola of *Amphicteis japonica*, ... × 55.
Fig. 4. Paleola of *Amphicteis gunneri*, from Norway, . . . × 55.
Fig. 5. Hook of *Amphicteis japonica*, ... × 700.
Fig. 6. Hook of *Grubianella antarctica*, ... × 700.
Fig. 7. Hook of dried specimen of *Grubianella antarctica*, var. (Station 158), × 700.
Fig. 8. Uncinus of *Samythopsis grubei*, ... × 700.
Fig. 9. Hook of *Eusamytha pacifica*, ... × 700.
Fig. 10. Posterior branchial hook of *Melinna maculata*, . . . × 90.
Fig. 11. Anterior bristle (as usual in Farrant's solution) of the same, . × 210.
Fig. 12. Ventral hook of the foregoing, ... × 700.
Fig. 13. Posterior branchial hook of *Melinna armandi*, . . . × 90.
Fig. 14. Posterior branchial hook of *Melinna cristata*, from Norway, . × 90.
Fig. 15. Anterior ventral hook of *Melinna armandi*, . . . × 700.
Fig. 16. Anterior ventral hook of *Melinna cristata*, . . . × 700.
Fig. 17. Anterior ventral hook of *Melinna pacifica*, ... × 700.
Fig. 18. Ventral hook of *Melinnopsis atlantica*, ... × 700.
Fig. 19. Hook from a fragment of the posterior region of *Terebella crassicornis*, ... × 700.
Fig. 20. Anterior hook of *Terebella grubei*, ... × 700.
Fig. 21. Anterior hook of *Terebella kermadecensis*, ... × 700.
Fig. 22. Anterior hook of *Terebella* (*Lanice*) *flabellum*, from Marion Island, × 350.
Fig. 23. Posterior hook of *Loimia savignyi*, ... × 620.
Fig. 24. Bristle of *Schmardanella pterochæta*, ... × 120.
Fig. 25. Tip of one of the same, ... × 350.
Fig. 26. Anterior hook of the foregoing, ... × 700.
Fig. 27. Anterior hook of *Pista sombreriana*, ... × 470.
Fig. 28. Anterior hook of *Pista fasciata*, ... × 470.
Fig. 29. Bristle of *Pista cristata*, ... × 350.
Fig. 30. Bristle of *Eupista darwini*, ... × 350.
Fig. 31. Anterior hook of the foregoing, ... × 470.
Fig. 32. Anterior hook of *Eupista darwini*, var., ... × 470.
Fig. 33. Anterior hook of *Pista abyssicola*, ... × 470.
Fig. 34. Anterior hook of *Pista mirabilis*, ... × 470.
Fig. 35. Anterior hook of *Pista corrientis*, ... × 470.



AMPHARETIDÆ & TEREBELLIDÆ

PLATE XXVIIIA.

PLATE XXVIIIA.

Fig. 1. Anterior hook of *Eupista darwini*, ... × 470.
Fig. 2. Anterior bristle of *Leæna neo-zealaniæ*, ... × 390.
Fig. 3. Anterior hook of the same, ... × 620.
Fig. 4. Anterior bristle of *Lanassa sarsi*, ... × 350.
Fig. 5. Anterior hook of the foregoing, ... × 620.
Fig. 6. Anterior bristle of *Lanassa benthaliana*, ... × 350.
Fig. 7. Anterior hook of the same, ... × 520.
Fig. 8. Anterior bristle of *Leæna abyssorum*, ... × 350.
Fig. 9. Anterior hook of the same, ... × 620.
Fig. 10. Anterior bristles of *Leæna antarctica*, ... × 350.
Fig. 11. Anterior hook of the foregoing, ... × 620.
Fig. 12. Anterior hook of *Leæna langerhansi*, ... × 620.
Fig. 13. Hook, from the middle of *Euthelepus setubalensis*, . . × 510.
Fig. 14. Anterior bristle of *Euthelepus chiliensis*, ... × 350.
Fig. 15. Anterior hook of the same, ... × 510.
Fig. 16. Posterior hook from fragmentary *Thelepus* sp. (Torres Strait), . × 510.
Fig. 17. Anterior hook of *Thelepus canadensis*, ... × 510.
Fig. 18. Anterior hook of *Thelepus* (A), St. Andrews, . . . × 510.
Fig. 19. Anterior hook of *Thelepus japonicus*, ... × 510.
Fig. 20. Anterior bristle of *Ereutho kerguelensis*, ... × 350.
Fig. 21. Hook of the same, ... × 1200.
Fig. 22. Hook of *Polycirrus kerguelensis*, ... × 1200.
Fig. 23. Anterior bristles of *Artacama challengeriæ*. *a*, one of the longer; *b*, one of the shorter series, ... × 210.
Fig. 24. Anterior hook of the foregoing, ... × 1060.
Fig. 25. Another hook from the same species, ... × 680.
Fig. 26. Bristle of *Ehlersiella atlantica* (off the Azores), . . . × 210.
Fig. 27. Hook of the same species, ... × 1060.

PLATE XXIXA.

PLATE XXIXA.

Fig. 1. Anterior bristle of *Artacama zebuensis*, ... × 210.
Fig. 2. One of the shorter and broader anterior hooks of the same, . × 1060.
Fig. 3. Anterior hook of *Terebellides strœmi*, var., . . . × 470.
Fig. 4. Posterior hook of the same, ... × 1060.
Fig. 5. Anterior hook of *Terebellides strœmi*, from Bergen, . . × 470.
Fig. 6. Posterior hook of the foregoing, ... × 1060.
Fig. 7. Anterior hook of *Terebellides strœmi*, var. (Station 149), . . × 550.
Fig. 8. Posterior hook of the same, ... × 1060.
Fig. 9. Anterior bristle (from the inferior series) of *Terebellides ehlersi*, . × 138.
Fig. 10. Anterior hook of the foregoing, ... × 470.
Fig. 11. Posterior hook, ... × 1060.
Fig. 12. Anterior hook of *Terebellides* sp. (Station 169), . . . × 790.
Fig. 13. Posterior hook of the same, ... × 1060.
Fig. 14. Bristle of *Syllis robertianæ*, ... × 400.
Fig. 15. Hook of fragmentary *Praxilla* (Station 76), . . . × 430.
Fig. 16. Anterior dorsal bristle of *Potamilla torelli*, . . . × 350.
Fig. 17. Paddle-shaped inferior bristle from the same tuft, . . × 350.
Fig. 18. Upper bristle, from the posterior region of the body, showing the tip greatly elongated, ... × 350.
Fig. 19. Anterior hook of the same species, ... × 390.
Fig. 20. Anterior bristle (dorsal group) of *Sabella zebuensis*, . . × 350.
Fig. 21. Inferior bristle (in profile), from the same region, . . × 350.
Fig. 22. Anterior hook of the foregoing species, ... × 390.
Fig. 23. Upper bristle, from the anterior dorsal region of *Sabella assimilis*, ... × 350.
Fig. 24. Inferior bristle, from the same foot, ... × 350.
Fig. 25. Anterior hook of the foregoing, ... × 390.
Fig. 26. Tip of an anterior bristle of *Hydroides multispinosa*, . . × 350.
Fig. 27. Anterior hook of the same, ... × 700.
Fig. 28. Anterior hook of *Serpula philippensis*, ... × 700.
Fig. 29. Tip of an anterior bristle of *Placostegus assimilis*, . . × 350.
Fig. 30. Anterior hook of the same species, somewhat flattened, after mounting in Farrant's solution,[1] . . . . × 700.
Fig. 31. Tip of an anterior bristle of *Spirobranchus occidentalis*, slightly curved by Farrant's solution.
Fig. 32. Anterior hook of the foregoing, ... × 700.

[1] The engraver unfortunately has made a mess of the fine and regular lines on the right.

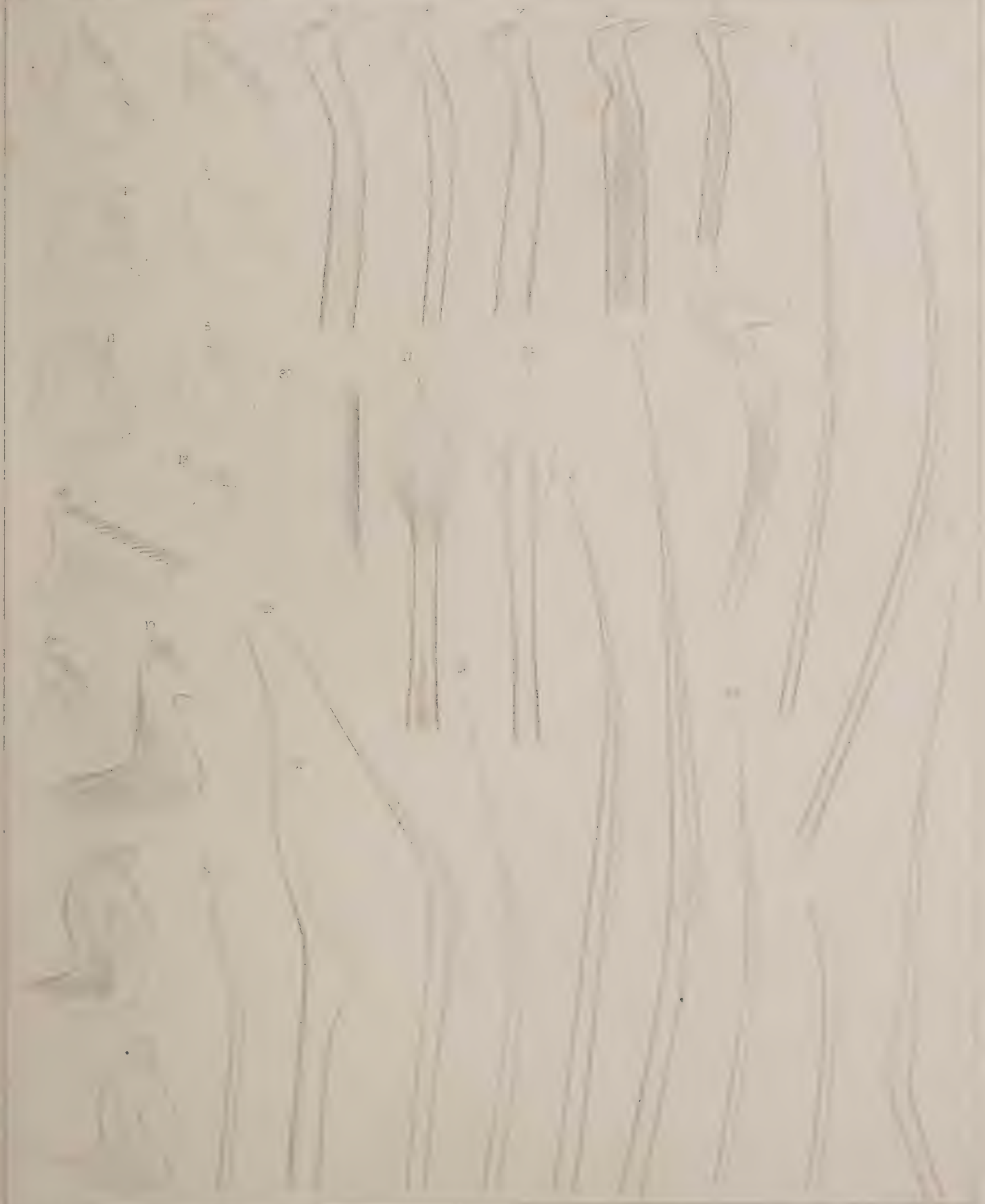


PLATE XXXA.

PLATE XXXA.

Fig. 1. Superior bristle, from the anterior region of *Sabella bipunctata*, . × 350.
Fig. 2. An inferior bristle, from the same group, ... × 350.
Fig. 3. Anterior hook of the foregoing, ... × 390.
Fig. 4. Dorsal bristle (with shorter tip than usual), from the anterior region of *Sabella fusca*, ... × 126.
Fig. 5. Tip of inferior bristle, from the same foot, ... × 126.
Fig. 6. Anterior hook of the species, ... × 390.
Fig. 7. Upper bristle, from the posterior region of *Laonome haeckelii*, . × 350.
Fig. 8. Tip of inferior bristle, from the same foot, ... × 350.
Fig. 9. Hook of the same species, ... × 390.
Fig. 10. Tip of an anterior bristle, from the upper series in *Branchiomma vesiculosum*, ... × 210.
Fig. 11. Tip of another, from the inferior group, ... × 210.
Fig. 12. Anterior hook of the foregoing form, ... × 390.
Fig. 13. Tip of an upper bristle, from the anterior region of *Dasychone bairdi*, ... × 350.
Fig. 14. Tip of an inferior bristle, from the same part, . . . × 350.
Fig. 15. Anterior hook of the foregoing species, ... × 390.
Fig. 16. Tip of an upper anterior dorsal bristle of *Dasychone picta*, . × 390.
Fig. 17. Tip of an inferior bristle, from the same foot, slightly turned round so as to show both wings, ... × 390.
Fig. 18. Anterior hook of the foregoing species, ... × 390.
Fig. 19. Tip of anterior bristle (dorsal group) of *Dasychone orientalis*, . × 350.
Fig. 20. Tip of one, from the inferior group, ... × 350.
Fig. 21. Anterior hook of the preceding form, ... × 390.
Fig. 22. Tip of anterior bristle (upper) of *Dasychone japonica*, . . × 210.
Fig. 23. Tip of bristle, from the inferior group of the same part, . . × 210.
Fig. 24. Anterior hook of the foregoing, ... × 390.
Fig. 25. One of the anterior bristles (with shorter tip) of *Placostegus ornatus*, × 350.
Fig. 26. Posterior bristle, from the same, ... × 350.
Fig. 27. Anterior hook of the foregoing, ... × 700.
Fig. 28. Anterior hook of *Placostegus benthalianus*, . . . × 700.
Fig. 29. Anterior bristle (with "bite" at tip) of *Placostegus mörchii*, . × 350.
Fig. 30. Anterior hook of the same, ... × 700.
Fig. 31. Tip of an anterior bristle of *Vermilia* sp. (Station 302), . . × 350.
Fig. 32. Anterior hook of the foregoing, the posterior margin incomplete, . × 700.

PLATE XXXIA.

PLATE XXXIA.

Fig. 1. Upper thoracic bristle of *Dasychone wyvillei*, . . . × 210.
Fig. 2. Inferior bristle of the same process, ... × 210.
Fig. 3. Anterior hook, from a large example of the foregoing, . . × 390.
Fig. 4. Superior thoracic bristle of *Dasychone nigro-maculata*, . . × 210.
Fig. 5. Inferior bristle, from the same foot, ... × 210.
Fig. 6. Anterior hook of the foregoing species, ... × 390.
Fig. 7. Bristle (of average form), from the anterior region of *Dasychone violacea*, ... × 210.
Fig. 8. Anterior hook of the same, ... × 390.
Fig. 9. One of the upper (not uppermost) bristles of the thoracic region of *Dasychone hubrechti*, ... × 210.
Fig. 10. Inferior bristle, from the same region, ... × 210.
Fig. 11. Anterior hook of the foregoing, ... × 390.
Fig. 12. Thoracic ventral bristle of *Protula capensis*, . . . × 350.
Fig. 13. Anterior hook of the species, ... × 700.
Fig. 14. One of the longer thoracic bristles of *Serpula sombreriana*, . × 430.
Fig. 15. Anterior hook of the same, ... × 700.
Fig. 16. Anterior hook of *Protula lusitanica*, ... × 700.
Fig. 17. Thoracic bristle of *Protula arafurensis*, ... × 350.
Fig. 18. Anterior hook of the foregoing, ... × 700.
Fig. 19. Anterior bristle of *Protula americana*, ... × 210.
Fig. 20. Hook, from the same region, ... × 700.
Fig. 21. Thoracic bristle of *Apomatus elisabethæ*, ... × 210.
Fig. 22. Anterior hook of the foregoing, ... × 700.
Fig. 23. Anterior bristle of *Serpula narconensis*, ... × 114.
Fig. 24. Tip of bristle, from the thoracic region of *Serpula narconensis*, var. *magellanica*, ... × 210.
Fig. 25. Anterior hook of the foregoing, ... × 430.
Fig. 26. Tip of an anterior bristle of *Pomatocerus strigiceps*, . . × 210.
Fig. 27. Tip of a posterior bristle of the same, ... × 350.
Fig. 28. Anterior hook of the species, ... × 430.

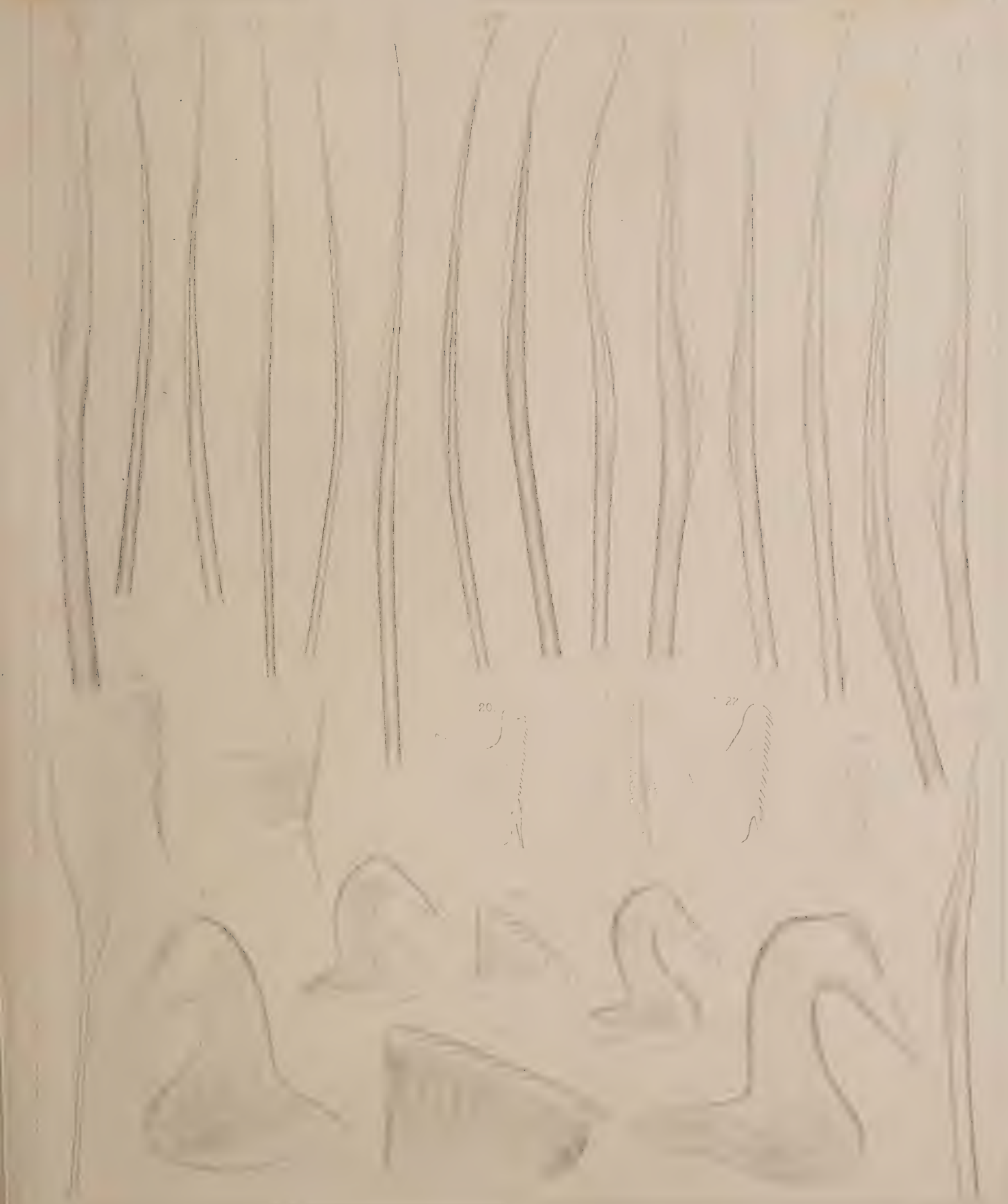

20.
21

PLATE XXXIIA.

PLATE XXXIIa.

The Lettering is the same in all the Figures.

e. Dorsal longitudinal muscles.
f. Ventral longitudinal muscles.
g. Oblique muscles.
j. Alimentary canal.
n. Nerve cords.

Fig. 1. Tip of a dorsal bristle of *Dasylepis equitis*, ... × 210.

Fig. 2. Extremity of a ventral bristle of the same, ... × 210.

Fig. 3. Tip of a dorsal bristle of *Polynoë* (*?*) *ascidioides*, . . . × 350.

Fig. 4. Tip of a supraspinous ventral bristle of the foregoing, . . × 350.

Fig. 5. Extremity of one of the inferior ventral bristles, . . . × 350.

Fig. 6. Transverse section of the anterior third of the body-wall of *Polynoella levisetosa*, ... × 24.

Fig. 7. Transverse section of the anterior third of the body-wall of *Eulepis wyvillei*, ... × 40.

Fig. 8. Foot of *Nephthys verrilli*, ... × 40.

Fig. 9. Transverse section of the body-wall in the anterior third of *Thalenessa digitata*, ... × 24.

PLATE XXXIIIA.

PLATE XXXIIIA.

Fig. 1. Horizontal median section through both eyes of *Genetyllis oculata*, showing their relation to the cerebral ganglion. (Somewhat diagrammatic.) Magnified about 150 diameters.

a, shows the junction of the anterior part of the sclerotic of the two eyes. The oval spaces are blood-vessels cut across. *b*, the cornea; a thin, transparent coat continuous with the outer chitinous covering of the sclerotic. *c*. Finely granular, clear, structureless material, probably of the nature of vitreous. *d*, pigment-layer of retina, lining the inner surface of the sclerotic and reflected over the anterior surface of part of the ganglion. *e*, the large cerebral ganglion, showing a partial division into two lateral lobes. The large ganglion cells are found near the periphery, while the interior is occupied by finer cells and molecular substance (see fig. 4, *e*). (The ganglion cells are here represented as rather too large.)

Fig. 2. Section through outer coat of eyeball at the periphery of the globe.

a, thin chitinous layer; *b*, epithelial cells and connective tissue stroma.

Fig. 3. Small piece of cornea viewed from inner surface, showing outlines of endothelial cells.

Fig. 4. Section through cerebral ganglion near its anterior part, showing part of both eyes.

a, single median blood-vessel cut across; *d.d.*, pigment-layer of retina of each eye; *e*, ganglion (imperfect) showing numerous ganglion cells; *f*, fibrous septum, continuous with sclerotic, separating the two lobes.

Fig. 5. Antero-posterior section through eyeball near outer side.

a, sclerotic coat; *b*, cornea, accidentally bent inward; *d*, pigment-layer of retina; *e*, lobe of the cerebral ganglion occupying the posterior part of the globe.

Fig. 6. Section through the pigment-layer of the retina. The (?) vitreous still adheres to it, but it has become detached from its other connections.

a, an appearance suggesting rods, but probably due to folds in the vitreous layer.

Fig. 7. Tangential section through the ganglion near its inner end, showing the pigment adhering to it all round.

Fig. 8. Similar to fig. 6.

Fig. 9. A unipolar ganglion cell; the process is long and somewhat tapering. Found detached, but closely in relation with the columnar layer.

Fig. 10. Pigment arranged in the form of large hemispherical bodies with the curvature outward; its colour is light reddish-brown (burnt-sienna). At its inner surface are several small vertically elongated deposits of dark *Sepia*-coloured pigment, each little aggregation corresponding with the outer or insertion-end of a rod. Between the outer end of this last small pigment aggregation and the outer rounded border of the large pigment body is a comparatively colourless linear area, in distinct contrast to the rest of the pigment-hemisphere.

Fig. 11. Large, round, dark pigment masses occurring in the periphery of the retina; one of them is placed at the inner end of an elongated columnar nucleated cell.

Fig. 12. Oblique section through pigment-layer. The pigment is seen here to be arranged in broad circles around clear areas, which latter seem to correspond to sections of rods. From their size and wide separation from each other these would appear to be club-shaped peripheral rods. Others are seen in section at *a*.

Fig. 13. Peculiar appearance in an oblique section through the rod-layer. The doubly contoured rings are apparently sections through the narrow ends of rods.

Fig. 14. Pigment arranged as in fig. 2, but here there is one large clear body in the midst of each pigment-hemisphere, probably nuclei.

Fig. 15. Also like fig. 2, but cut obliquely. Here the non-pigmented linear areas are cut across and appear as small round clear bodies.

Fig. 16. Section through peripheral part of retina. The pigment is in isolated masses, which are probably distinct cells. Along the inner border of the pigment is a thin transparent line, the representative of the rod-layer. Nuclei occur immediately to the outer side of the pigment. One of the pigment-masses has a long process (*a*) extending outward, pigmented for some distance, and then hyaline and wavy, like those represented in figures 15, 17, and 18. At the right hand extremity of the section is a large pigment body with cell attached (displaced).

Fig. 17. Large nucleated cells in connection with the peripheral pigment bodies. Two of them have clear tapering structures extending inward, representing the rod-layer. Each pigment body is formed of numerous oval dark pigment granules, each about 1 mm. long by 0·5 mm. broad.

Fig. 18. Section through peripheral part of retina. The general arrangement is similar to that shown in fig. 8. Several of the nuclei seem to belong to pigment-cells.

Fig. 19. Piece of pigment-layer from near the periphery of the retina, viewed from its inner surface. The disposition of the small aggregations of pigment corresponding to the insertion of the rods is well shown. These are here placed with much regularity at considerable distances from one another.

Fig. 20. Vertical section through pigment-layer with club-shaped rods attached. Fine pigment granules are seen extending for some way along the narrow outer ends of the rods, but evidently on the surface, not in the interior.

Fig. 21. Section through pigment with small club-shaped rods attached. The general arrangement is similar to that in figs. 2, 6, and 7.

Fig. 22. Section through centre of lens, showing cortex, nucleus, and intermediate crescentic spaces arranged concentrically with their concavities inward.

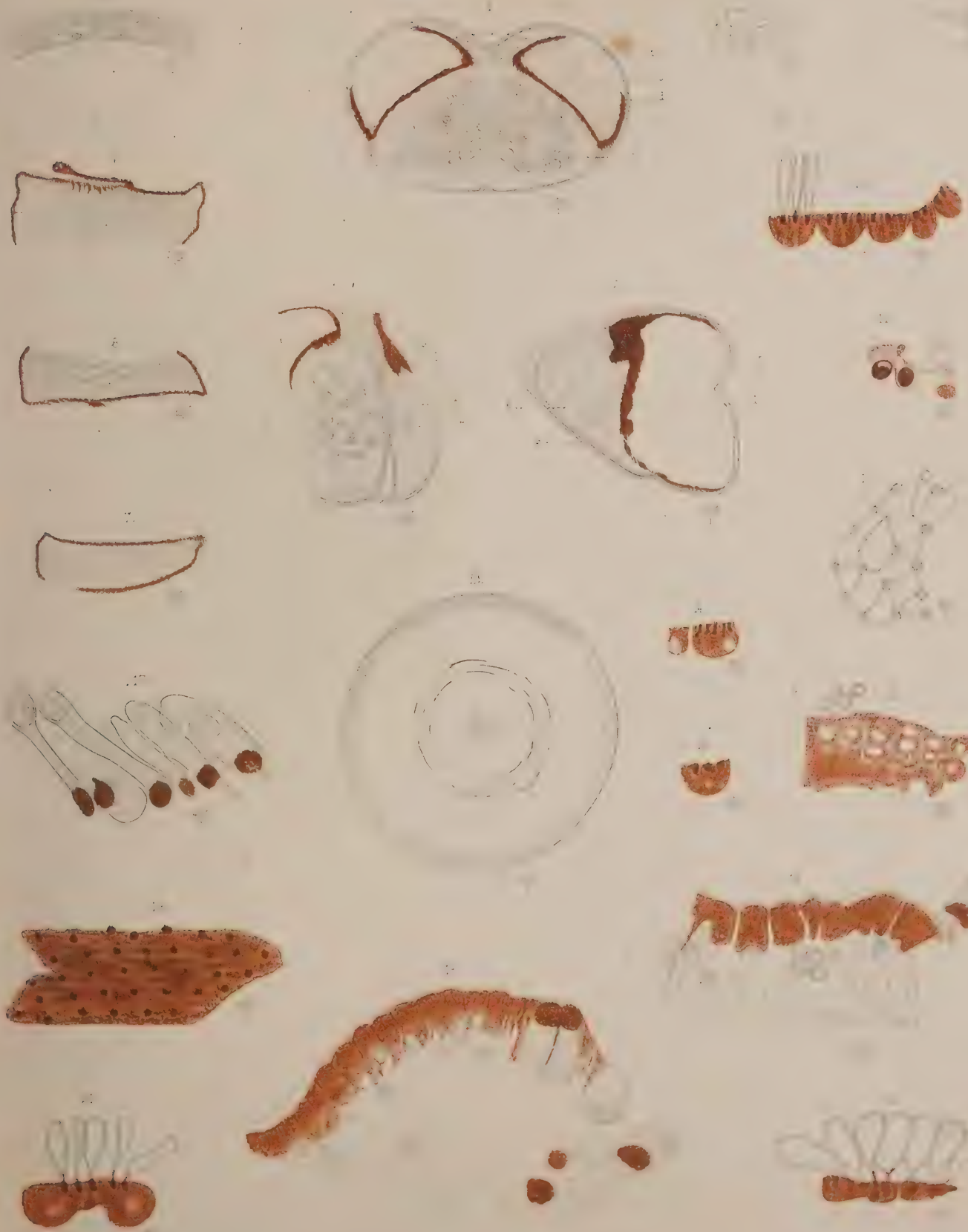


PLATE XXXIVA.

PLATE XXXIVA.

Fig. 1. Vertical section through entire retina. *a*, rod-layer; *b*, pigment; *c*, columnar cells. At *d* the pigment-layer is almost quite devoid of pigment, and is seen to be defined by a sharp border both internally and externally: one small nucleus is visible in this area. At *e* is a hyaline-looking tapering process resting by its base on the pigment-layer, and extending outward for some distance between the columnar cells.

Fig. 2. *a*, Transverse section of rods showing arrangement of cortex in two crescents nearly enclosing a central area; they apparently just touch at one place and leave a slight gap at the opposite side. *b*, transverse section of other rods. The cortex is in the form of doubly contoured circles enclosing a large central space.

Fig. 3. Vertical section through retina. Most of the rods have become detached. Several clear, tapering processes (like *e*, fig. 1) are visible: one of these extends quite half way through the columnar layer.

Fig. 4. Vertical oblique section through pigment-bodies (? cells). One or two fragments of rods are attached. Clear spaces in the pigment correspond to sections of processes from rods or columns. Clear tapering processes extend outward from the pigment-bodies.

Fig. 5. Two detached rods viewed under a high power. Pigment-granules adhere to their inner ends. The rods present an involuted appearance, suggesting their having been originally formed by the folding in of a thin, vertical, plate-like structure.

Fig. 6. Vertical section through rod and pigment-layers at centre of fundus. The rods are long, narrow, and cylindrical, and exhibit the appearance described by Greeff as transverse striation. The pigment is mapped out into areas suggesting a cellular structure, each corresponding to the insertion of one, or at most two rods. Pigment-granules are traceable for some little distance along the outer ends of the rods.

Fig. 7. Transverse section of the body-wall in the anterior third of *Syllis gigantea*, . × 20.

Fig. 8. Portion of *Syllis ramosa*, from the Arafura Sea, showing a head, . . . × 12.

Fig. 9. Anterior end of a female bud of the same species with long simple bristle-tufts, . × 24.

Fig. 10. Anterior region of another female bud of the same species, from Ki, . . × 24.

Fig. 11. Twenty-first foot of *Exogone heterosetosa*, ... × 430.

Fig. 12. Head and anterior region of a male bud of *Syllis ramosa*, from Prof. Moseley's specimen, ... Enlarged.

Fig. 13. Posterior extremity of the same, ... Enlarged.

PLATE XXXVA.

PLATE XXXVA.

The Lettering is the same in all the Figures.

b. Cuticle.
c. Hypoderm.
d. Circular muscular coat.
e. Dorsal longitudinal muscles.
f. Ventral longitudinal muscles.
g. Oblique muscles.
j. Alimentary canal.
k. Tufts of spines and bristles.
l. Glandular organs.
n. Nerve cords.

Fig. 1. Transverse section of the body-wall of *Nothria willemoesii* in the anterior third, ... × 12.

Fig. 2. Transverse section of the same region of the body in *Nothria ehlersi*, . × 30.

Fig. 3. Nerve-area (in section of the anterior third) of *Glycera kerguelensis*, . × 74.

Fig. 4. Papillæ of the proboscis of the same species, ... × 90.

Fig. 5. Nerve-area of *Glycera lamelliformis*, ... × 55.

Fig. 6. Nerve-area (ganglionic region) of the anterior third of *Glycera magellanica*, ... × 90.

Fig. 7. Section of the interganglionic region in the same species, . . × 90.

ONUPHIDIDÆ & GLYCERIDÆ.

PLATE XXXVIA.

PLATE XXXVIA.

The Lettering is the same in all the Figures.

a. Œsophageal region.
b. Cuticle.
bb'. Small intestine.
c. Hypoderm.
cc'. Vascular mesentery.
d. Circular muscular coat.
e. Dorsal longitudinal muscles.
f. Ventral longitudinal muscles.
g. Oblique muscles.
hh. Reproductive glands.
z. Meshes containing yellowish masses like oil in *Phyllochætopterus*.

Fig. 1. Body-wall of *Travisia kerguelensis* in vertical transverse section, . × 90.

Fig. 2. View of the surface of the skin of the foregoing, . . . × 90.

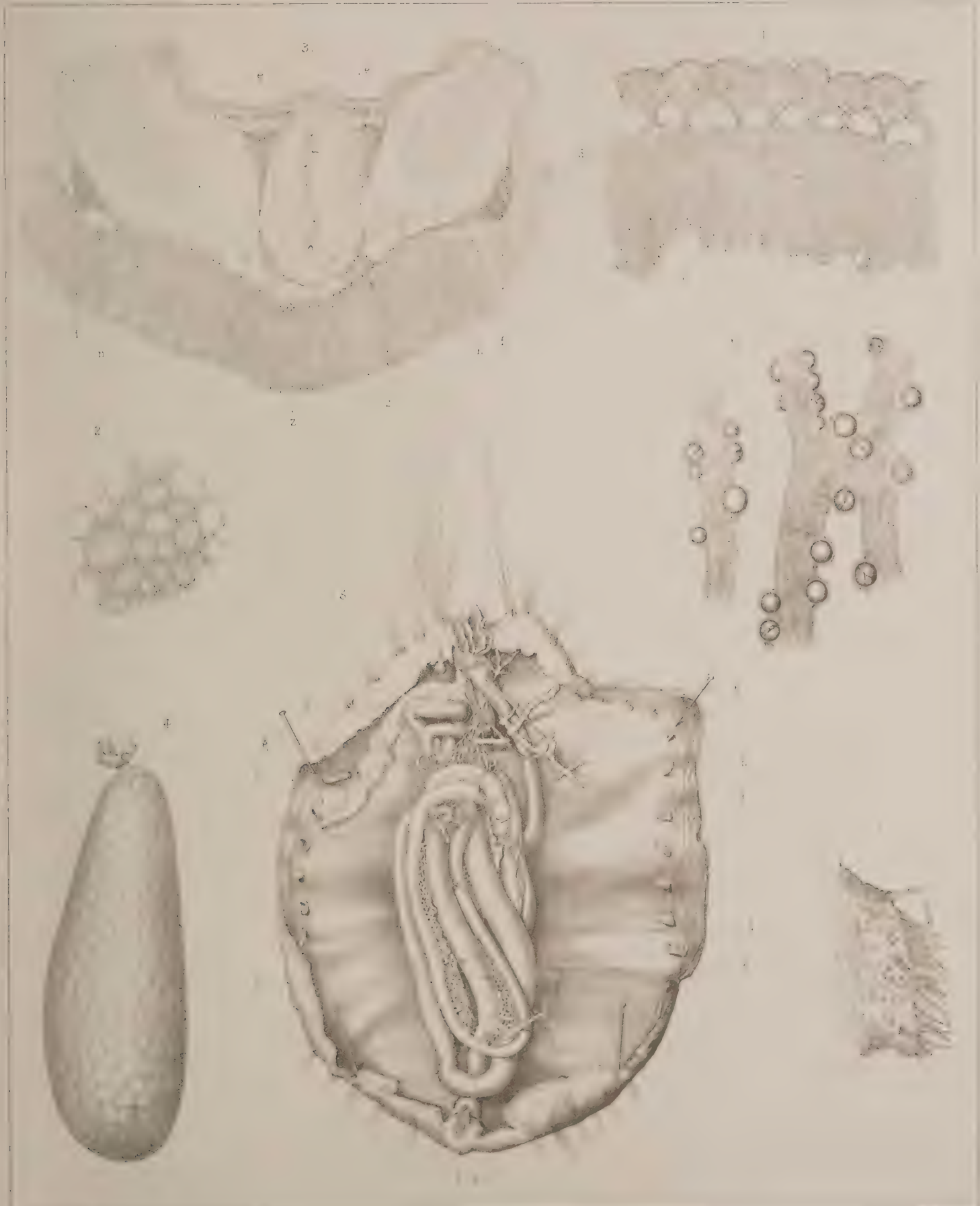
Fig. 3. Transverse section of the anterior third in *Phyllochætopterus claparedii*. *z*, *z*, peculiar secretion, probably connected with phosphorescence, ... × 40.

Fig. 4. *Trophoniphila bradii*, a parasitic Crustacean from the oral region of *Trophonia wyvillei*, ... Enlarged.

Fig. 5. Alimentary apparatus of *Trophonia wyvillei*, from the ventral aspect. *a*, œsophageal or firm region of the alimentary canal; *b*, *b'*, small intestine; *c*, *c'*, vascular mesentery between great blood-vessel and gut; *d*, large intestine; *e*, rectum; *f*, anus; *g*, proboscis (?); *h*, *h*, reproductive glands, . . . Enlarged.

Fig. 6. Refractive globular bodies prevalent over the vessels of the intestine, × 250.

Fig. 7. Fimbriated end of proboscidian region (*Trophonia wyvillei*), where fixed to the intestine, ... Enlarged.



CHLORÆMIDÆ & CHÆTOPTERIDÆ.

PLATE XXXVIIA.

PLATE XXXVIIA.

The Lettering is the same in all the Figures.

b. Cuticle.
c. Hypoderm.
d. Circular muscular coat.
e. Dorsal longitudinal muscles.
f. Ventral longitudinal muscles.
g. Oblique muscles.
j. Alimentary canal.
k. Tufts of spines and bristles.
n. Nerve cords.
r. Reproductive organs.
v. Ventral channel.
vs. Ventral blood-vessel.
x. Base of foot.

Fig. 1. Transverse section of the body-wall of *Trophonia wyvillei* in the ventral median line. Two of the long papillæ are covered with Diatom ooze, ... × 90.

Fig. 2. Nerve-area of *Nicomache capensis* in transverse section, with the united insertions of the oblique in the middle line superiorly. *v*, section of loops of ventral vessels, ... × 90.

Fig. 3. Transverse section of the body-wall of *Praxilla köllikeri*, . . × 55.

Fig. 4. Transverse section of the anterior third of *Praxilla assimilis*, . × 55.

Fig. 5. Nerve-area of *Praxilla abyssorum*, ... × 138.

Fig. 6. Transverse section of the anterior third of the body-wall of *Phyllocomus croceus*, Grube, ... × 20.

Fig. 7. Transverse section of the posterior region of *Loimia savignyii*, . × 40.

Fig. 8. Section of the ventral margin in the anterior third of *Praxilla köllikeri*, in which the parts have been stretched so as to demonstrate the neural canal, ... × 55.

PLATE XXXVIIIA.

PLATE XXXVIIIA.

The Lettering is the same in all the Figures.

c. Hypoderm.
co. Remarkable development of basement tissue beneath the hypoderm.
d. Circular muscular coat.
dv. Dorsal blood-vessel.
e. Dorsal longitudinal muscles.
f. Ventral longitudinal muscles.
fe. Longitudinal band of fibres in median ventral line.
g. Oblique muscles.
j. Alimentary canal.
j'. Proboscis.
n. Nerve cords.
v. Ventral channels.
vs. Ventral blood-vessel.
z. Meshes containing yellowish masses like oil in *Phyllochætopterus.*

Fig. 1. Transverse section of the ventral body-wall of *Pista abyssicola*, showing the nerve-area enclosed by the circular muscular coat. *z*, glandular tissue, ... × 55.

Fig. 2. Transverse section of the anterior third of the body-wall of *Pista mirabilis*. *fe*, band of longitudinal muscular fibres inside circular coat; *v*, vessels around alimentary tract; *z*, glandular tissue apparently in connection with the hypoderm, . . . × 40.

Fig. 3. Transverse section of the anterior third of the body-wall of *Pista japonica*, ... × 24.

Fig. 4. Transverse section of the anterior third of *Terebellides strœmi*, var., from Kerguelen. *je*, remarkable apparatus intricately folded. The figure has been inverted, ... × 55.

Fig. 5. Transverse section of the ganglionic region of the nerve-area in *Dasychone occidentalis*. *co*, modified basement-tissue, . . × 55.

Fig. 6. Transverse section of the interganglionic region in the same species. *co*, modified basement-tissue, ... × 55.

THE CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY

TEREBELLIDÆ & SABELLIDÆ

PLATE XXXIXA.

PLATE XXXIXA.

Fig. 1. Anterior hook of *Praxilla abyssorum*, ... × 350.

Fig. 2. Portion of a branchial radiole (near the base) of *Dasychone bairdi*. The tips of the pinnæ have been injured, . . × 12.

Fig. 3. Fragment of a branchial radiole of *Dasychone picta*, partially turned round so as to expose one of the external processes, . × 90.

Fig. 4. View of a portion of one of the branchial arms of *Dasychone orientalis*, ... × 90.

Fig. 5. Fragment of the base of a branchial radiole of *Dasychone japonica*, × 12.

Fig. 6. Portion of the middle of a branchial process of *Dasychone nigro-maculata*, ... × 12.

Fig. 7. View (near the tip) of a portion of a branchial radiole of *Dasychone violacea*, ... × 12.

Fig. 8. Portion of the base of a branchial process of *Dasychone capensis*, × 12.

Fig. 9. Two segments, from the distal region of a branchial radiole of *Dasychone bairdi*, ... × 12.

Fig. 10. Crustacean parasite (*Praxillinicola kröyeri*) of *Praxilla abyssorum*, Enlarged.

Fig. 11. Crustacean parasite (*Œstrella levinseni*) of *Ehlersiella atlantica*, . Enlarged.

Fig. 12. View of the distal aspect of the upper spinous circle of *Hydroides multispinosa*, ... × about 24.

Fig. 13. Tube formed of a scale-like arrangement of shells from Port Jackson, Sydney, ... About natural size.

SABELLIDÆ &c

AUG 1956
LIBRARY
POFI
FISH & WILDLIFE
SERVICE